

THE LARYNGOSCOPE.

VOL. XVIII. ST. LOUIS, MO., NOVEMBER, 1908. No. 11.

ORIGINAL COMMUNICATIONS.

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FURTHER OBSERVATIONS ON THE ROENTGEN-RAY EXAMINATION OF THE ACCESSORY NASAL SINUSES.*

BY E. W. CALDWELL, M. D., NEW YORK.

The members of this society are all familiar with the results obtained by examination of the accessory sinuses by means of the Roentgen-ray, and you are all better able than I am to estimate the practical value of such examinations. I shall, therefore, have little to say of the clinical aspect of the subject, but shall consider in this paper chiefly the Roentgen-ray technique.

In the beginning it may be well to consider for a moment some of the very prevalent erroneous ideas concerning X-ray examinations in general. The impression still prevails that the X-ray is a very powerful or special form of light by means of which we may photograph bones and other anatomical structures ordinarily hidden from our view. The wonderful development in photographic apparatus and materials, and the well merited popularity of amateur photography, have made it easy for us to suppose that X-ray work is merely another species of photography. Enterprising manufacturers of X-ray apparatus have found it to their interest to encourage the belief that possession of their wonderful appliances would bring within the reach of anyone the pleasant pastime of making the so-called X-ray photographs.

This misconception of the principles involved in X-ray diagnosis is, in a great measure, responsible for the disappointments of those who have attempted to use the X-ray without knowing how or when it may be of service to them.

*Presented at the 14th Annual Meeting of the American Laryngological, Rhinological and Otological Society at Pittsburg, May 30, 1908.

In the first place the X-ray does not give us a photograph or even a picture that is like any other picture we know. We are so accustomed to photographs that we do not stop to analyze the physiological processes involved in interpreting them. We do not realize that the ability to obtain accurate impressions of the subject represented by a photograph has been acquired by years of experience. Travelers tell us that uncivilized people acquire very slowly the ability to interpret an ordinary photograph, and that it may take months for a Kaffir native to learn to recognize a portrait of one of his companions.

In viewing a photograph or a picture, the retina receives an impression of light and shadow, and perhaps of color, which is a more or less perfect imitation of the effect which would be produced by viewing directly the object portrayed.

The X-ray gives us projections which sometimes strongly resemble pictures, but these projections never portray an object as the eye would see it. It is therefore unsafe for anyone to attempt to interpret such a projection as he would a picture. We must guard against false impressions of perspective, and must adopt a new view point, which for many seems to be as difficult to acquire as for the Kaffir native to grasp the meaning of an ordinary photograph. When one has acquired this point of view the lights and shadows of a skiagraph represent only results from which he must deduce the cause; he knows that they do not present a front view or a back view or any other *view*, and the expressions "X-ray picture" and "X-ray photograph" cause him weariness and depression. When this point of view has become more prevalent the pictorially excellent skiagraph of a hand or a foot made by some enthusiastic amateur will no longer excite wonder, and the photographers, electricians and janitors who now make the so-called X-ray photographs in many hospitals, will have their activities transferred to other fields where they will be less a menace to the public health.

X-ray appliances are still crude and comparatively undeveloped, and they have not approached the degree of perfection of the apparatus that has brought photography within reach of the amateur. In recent years the demand for more perfect results and the enlarging field of usefulness of Roentgen-ray diagnosis has made it necessary to use more and more elaborate and expensive apparatus. In 1897, when the art was new, one could have bought a fair X-ray outfit for \$200, and the best tubes then available did not cost

more than \$15. These outfits were more or less useful toys, and the same criticism applies to many of the outfits that are now sold to physicians who are inexperienced in this work. With the best appliances now obtainable difficult skiagraphic work, such as we have under consideration, requires a degree of skill and judgment comparable with that which is expected in any other medical or surgical procedure, and greater than we can reasonably expect from the hospital photographer or janitor.

In the less difficult applications of the X-ray a very poor skiagraph may give useful information, and may, therefore, be mistaken for good work. A difficult and brilliant X-ray diagnosis is often less appreciated than a pictorially good plate of some easy subject like a shell fish or a mummy's hand.

An important feature of the diagnostic use of X-rays in the nasal tract is that in this field mediocre work is useless or worse, and the very best that can be done often leaves much to be desired. Many operators who have believed themselves expert because they could make useful skiagraphs of fractures, foreign bodies, teeth, etc., have had so many failures in frontal sinus examinations that their work in this field is of no value.

There is no mystery about this work, and no justification for the statements occasionally heard to the effect that success in this field depends upon some trick which is the secret of a few. It is true that the majority of owners of X-ray outfits are unable to make good skiagraphs of the frontal sinus region, but it is also true that such work is done satisfactorily by practically all of the really competent Roentgen-ray specialists, although probably no two of them employ the same tricks of technique. Excellent work has been done also by a few surgeons and rhinologists who have given the subject the serious attention that it demands and deserves. The comparatively few successes and many failures in the work cannot be charged to secrets of technique, but result partly from the fact that the amount of attention necessary for good work has generally been underestimated.

The difficulty of the work is easy to understand when we remember that the skiagraph is a composite shadow of everything lying between the source of rays and the photographic plate, and that the different objects cast stronger or weaker shadows, according to their relative thickness, their density, and the atomic weights of the elements of which they are composed. A skiagraph of a hand is essentially an X-ray shadow of the bones, which compose a large

part of it, and which are but thinly covered by soft tissues, much less resistant to the rays. Such a skiagraph may be easily made with almost any X-ray outfit, and it matters little whether the rays used are of high or low penetration, because the contrast in X-ray opacity of these tissues is great. In making a skiagraph of the frontal sinus region the rays must pass through the head in a long diameter; they must traverse the occipital bone and the brain, but the shadows of these thick and dense structures must not obscure the shadows of the relatively thin bones forming the sinus, or those of the fluids contained therein. It will be evident, therefore, that for this work not only must the penetrating quality of the rays be regulated accurately in order to secure differentiation, but that in order to produce sufficient effect upon the photographic plate, the rays must be powerful, and the exposure long. To obtain all these conditions requires careful manipulation and the best appliances obtainable. The chief difficulty is to obtain tubes that may be operated for these long exposures without breaking, and without too much change in the quality of the rays emitted. No two X-ray tubes are exactly alike, and in practice I find that only about one in five or six of the tubes I buy is suitable for frontal sinus examinations, although for most work they would all be useful.

With a good tube and exciting apparatus a skiagraph of a wrist or hand may be made with an exposure of one second or less, but under the same conditions a frontal sinus exposure will require from 20 to 50 seconds. During such short exposures as one to five seconds, the ordinary tube will not get hot enough to endanger its life or seriously interfere with the quality of the rays emitted, but only a very good tube will deliver continuously the same quality of rays during the long exposure necessary for a good frontal sinus plate. After such an exposure it is advisable to give the tube a rest of at least half an hour to let it cool off before using it again. When the tube gets hot, gases are driven from the glass and metal surfaces, reducing the vacuum, and with it the penetration of the rays. For this reason I prefer large tubes with eight-inch bulbs, and very heavy targets. A given amount of gas liberated in a large chamber of course produces less change of pressure than in a small one, and the rise of temperature in a large heavy target is less than in a smaller one.

The resistance of the tube must be adjusted for rays of high enough penetration to pass through the skull and brain, but rays of too high penetration will not give the contrasts that are neces-

sary. I think that the best penetration is about nine or ten on the Benoist Scale. With this degree of penetration there is danger of cracking or puncturing the tube during a long exposure, and I have frequently ruined, in a single sinus examination, a tube that might have been used safely for a hundred or more skiagraphs requiring less prolonged exposure. It seems to me that in every successful sinus examination the tube must be strained much beyond the limit of safety. On account of this strain the exposure should be shortened as much as possible by using the fastest plates obtainable. My best work has been done with plates made in Germany, but for the last year these plates have proven so unreliable that I have had to abandon them altogether and use American plates, which are fully 25 per cent slower.

The development of the sinus plates does not differ from that of any other skiagraph. Developers giving density are to be preferred, but no two operators agree as to just what is the best developer. My best results have been obtained with pyrogallie acid; next to this I prefer hydroquinone.

When one is provided with the best X-ray outfit obtainable, and has learned to operate the tubes not merely to give X-rays, but to deliver rays of approximately the right degree of penetration for a sufficiently long period, he may properly consider the details of arrangement of plate, tube and subject necessary to show the nasal sinuses to best advantage. My own views on the subject were presented in a paper read before the American Roentgen Ray Society in September, 1906, and published in the American Quarterly of Roentgenology for January, 1907. Since that time I have not modified my technique, except to lengthen the exposures, and thus compensate for the slower plates. Not only has this increased the wear and tear on tubes, but it seems to me that the results I get now are not so good as with the fast plates.

It is, of course, necessary to make a transverse projection in order to show the depth of the frontal sinus. In this projection the rays pass through a short diameter of the skull. The same degree of penetration (Benoist 9 to 10) as for the antero-posterior projection will give good results, but for this plate the quality of the rays is comparatively unimportant. The exposure need not be more than half so long as for the antero-posterior projection, and there is therefore much less strain on the tube. The plate may be supported in contact with the side of the head and in a plane parallel to the median plane

of the skull. The ray which is perpendicular to the plate should pass through the glabella. This projection is comparatively easy to make, and there should be few failures and little breakage of tubes. The knowledge of the antero-posterior depth of the frontal sinus, obtained from the transverse projection, is often useful in arriving at a correct interpretation of the antero-posterior projection. If the sinuses are deep the quantity of fluid they may contain is greater and the shadows cast by the fluid will be correspondingly stronger. When the sinuses are very shallow it will sometimes be impossible to decide whether they contain fluid. It has been proven that an edematous lining membrane will cast as dense a shadow as a collection of pus or other fluid containing the same amount of water, and this should always be borne in mind.

The antero-posterior projection is the one which shows the size and outline of the sinuses and the number and position of their septa, and enables us to ascertain the presence or absence of fluid, either free in the cavity or in an edematous lining membrane. This projection requires the long exposure, and is the one in which the operator is most likely to ruin his best tube, and to lose that cheerful but dignified composure that should always characterize the medical man.

In making this exposure it is important to use rays of as nearly as possible the degree of penetration before mentioned and to maintain them for from 20 to 50 seconds, according to the thickness of the skull and the power of the exciting apparatus. The plate is placed in contact with the face of the subject, and the head as well as the plate and tube must be supported so that there will be no movement during the exposure. With the average skull the frontal sinus will be best shown when the ray passing through the glabella in the median plane makes an angle of about 25° to 28° with the plane of the base of the skull. In making this exposure it matters little whether the patient lie with face resting upon the plate with the tube above and behind, or on a canvas stretcher with tube underneath and plate supported above and in contact with the face. Personally I consider the last mentioned position more convenient, but it requires special appliances which are not obtainable in the instrument shops.

In most cases the proper direction of rays may be obtained with sufficient accuracy by placing the tube so that the glabella, the parietal eminences and the target of the tube are approximately in the same plane, the source of rays, of course, lying in the



PLATE I.

THE
JOHN C. REAGAN
LIBRARY



PLATE II.

THE
JOHN CREESE
LIBRARY

RIGHT

LEFT



E.W. CALDWELL, M.D.
NEW YORK

PLATE III.

THE
JOHN C. STONE
LIBRARY

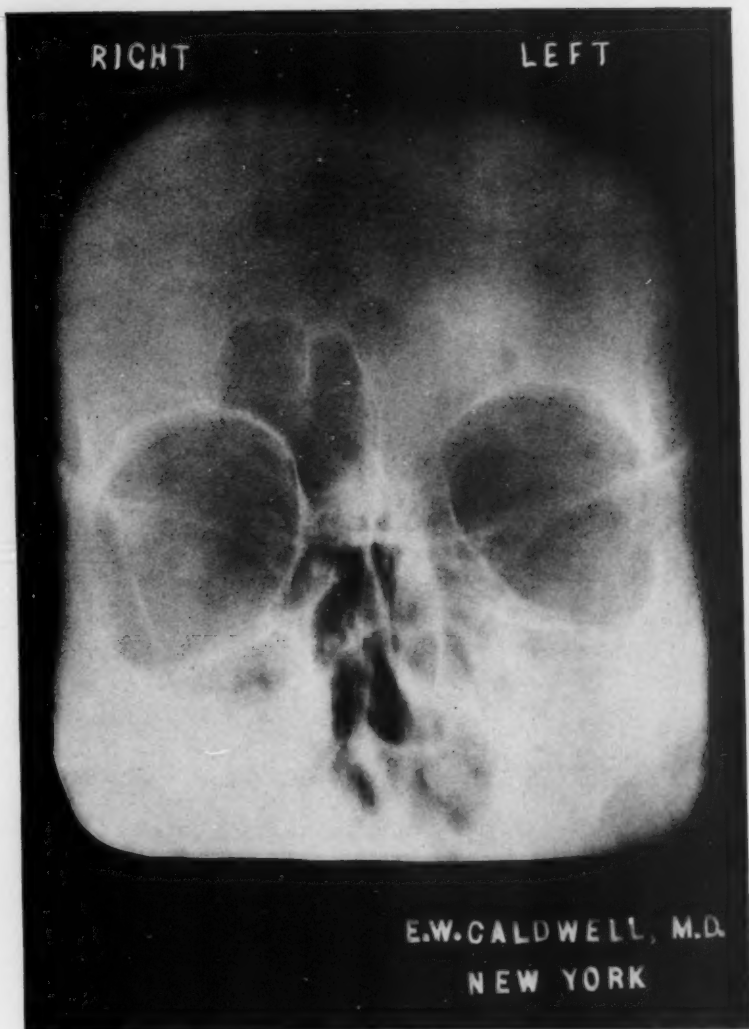


PLATE IV.

THE
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PLATE V.

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mesial plane of the skull. Failures seldom result from inaccuracy of this angle, but most of them are due to inability to obtain from the Crookes tube the right quality of rays for a sufficiently long period.

In conclusion I have to say that perhaps this paper has unduly emphasized the difficulty of the work. Some operators have apparently had less trouble with it than I have had. From my own experience, however, I feel fully warranted in recommending that these examinations be made by Roentgen-ray specialists when such men are available. Many rhinologists who do not live in large cities find this impossible, and may employ this method of diagnosis only by equipping their own offices with X-ray outfits and doing the work themselves. The writer hopes that they may derive some help from the suggestions in this necessarily incomplete paper. It is to be hoped and expected that future developments in appliances and technique will remove many of the difficulties that have harassed the pioneers in this field.

No. 480 Park Avenue.

EXPLANATION OF ROENTGEN-RAY PLATES.

PLATES I, II and III.—Three plates of the same skull, to show the effect of different positions of the X-ray tube. In Plate I the shadows of frontal sinuses are almost obscured by those of the base of the skull. In Plate II frontal and maxillary sinuses and ethmoid cells are shown. In Plate III the angle of the "principal ray" is too acute and there is too much distortion.

PLATE IV.—Frontal sinuses slightly asymmetrical. Left frontal and maxillary sinuses and ethmoid cells contain fluid.

PLATE V.—Maxillary sinuses and ethmoid cells normal. Frontal sinuses asymmetrical and slightly cloudy because very shallow.

SOME SURGICAL PRINCIPLES ESSENTIAL TO THE CURE OF FRONTAL SINUS EMPYEMAS.*

BY JOHN F. BARNHILL, M. D., INDIANAPOLIS.

A review of the recent literature of the surgical treatment of the pyogenic affections of the frontal sinus shows that much difference of opinion exists among operators of experience concerning the proper plan of procedure. The varying degrees of severity of the disease that may be present in the sinus, and the several accessory conditions that may occur in a given case, often make the choice of plan debatable, but in those cases of suppuration of the sinus where the symptoms are quite similar in every essential it would seem that too great a difference of opinion exists among operators of apparently equal prominence and experience. Such a difference of opinion is unfortunate for those operators of less experience, who as a result, too often feel a sense of doubt and uncertainty when contemplating the performance of frontal sinus surgery. The diversity of opinion emphasizes the fact that this class of surgery is often difficult, and that ideal surgical measures have not yet been established.

To some extent no doubt the present views concerning frontal sinus surgery are the result of the rather rapid evolution of the rhinologist from a condition of practice in which his chief duty, only a few years ago, seems to have been to cleanse and medicate the mucous membranes of the upper air tract, to that which to-day may require the execution of the most difficult surgical measures, involving not only the nose, but also the more distant and intricate structures of the head and neck. This evolution from the erstwhile rhinologist who was a sprayer of noses, to the present rhinologist, who must be a high type of surgeon, has in some measure been responsible for two sets of operators, viz.: Those who believe that all, or nearly all, cases of accessory nasal sinus suppuration should be treated by the intra-nasal route, and those who hold that while the simple sinus empyemas may usually be thus successfully managed, that when much actual pathological change has taken place in the structure within the sinus or its bony environs external surgery should usually be chosen.

*Read before the Section on Laryngology and Rhinology of the New York Academy of Medicine, May 23, 1908.—For complete discussion of this paper, see *THE LARYNGOSCOPE*, August, 1908, page 667.

The discussion which continues between that class of surgeons who maintain, as does Ingals, that ninety-five per cent of all cases of suppurative frontal sinus disease can be cured by the intra-nasal route, and that class which believes that the greatest certainty of cure, and the least danger to the patient lies in the methods of operation by external surgery, calls forth some good arguments in support of their respective beliefs. The intra-nasal surgeon points out in support of his position the alleged facts that ample drainage, and the free admission of air into the diseased sinus will cure all except the worst cases, and that as a result of the concealed operative measures required, no unsightly scar remains. The chief argument of those who prefer external surgery and the only one they consider absolutely necessary to make is, that thereby only can perfect drainage be secured, and the diseased structures be completely removed. The more or less scar tissue which results from external surgery of the sinus, while always an objectionable feature, is by this class of surgeon regarded as a sequence absolutely necessary to a successful issue, and therefore entirely justifiable.

This paper is not, however, greatly concerned in the dispute between the two classes of surgeons, but it is rather with the *surgical* principles essential to the cure of sinus empyema which should govern whichever method is chosen, that we shall be most interested; for both admit that a certain number of all cases of suppurative sinus affection must be operated by the external route, and that a certain percentage is also curable by intra-nasal procedures.

Good results from the practice of any method must depend largely upon the proper application of certain well established surgical principles. Aside from an aseptic technic, which should be as perfect as possible in every case, the principles upon which all successful sinus work must depend, are (1) the complete removal of all hopelessly diseased pyogenic structures; (2) provision for ample drainage of the operated parts; (3) healing the diseased cavity either by a healthy, non-suppurative lining, or by the complete obliteration of the space by means of granulation tissue. The true value of either the external or intra-nasal method of treatment of suppurative frontal sinus disease can, therefore, be excellently judged by subjecting each plan to the standard of requirements of the above principles. Of course, in addition to these principles, the length of time the patient must suffer or be inconvenienced by

the necessary treatment subsequent to each and the actual danger to life resulting, although not surgical principles, are nevertheless often the result of the application of correct or faulty principles, and must, therefore, in justice, be considered. Let us apply these principles first to the method of treatment by intra-nasal drainage.

The efforts of operators like Ingals, Halle, Good and others to cure frontal sinus suppuration by the intra-nasal route, and the ingenious devices which they have perfected for entering and draining the frontal sinuses, should receive the heartiest commendation, but seasoned always, of course, by a word of warning to the inexperienced. Undoubtedly a large percentage of cases in which structural changes have not been extensive, and in which the anatomic formation of the sinus is normal can be and are cured by the simple provision thus made for good drainage. When, however, anomalies in the anatomic structure of the sinus are present, and when extensive pathologic tissues have been formed within, drainage alone is not often sufficient to bring about a cure; for in most instances it is impossible to remove the diseased pathologic contents of the sinus, or to correct its anomalous structure by measures directed through the comparatively small opening which it is possible by this method to provide for the drainage. Moreover, in case of the frontal sinus it has been considered a pretty well settled point that it is not possible or safe to enter the sinus with instruments intended for the enlargement of the infundibulum, in a considerable percentage of cases. Mosher (Candidate's Thesis for American Laryngological Association), after a study of the applied anatomy of the frontal sinus in 100 wet specimens, and fifty cleaned skulls, states that it is only by chance that the naso-frontal duct can be catheterized. Turner (Accessory Sinuses of the Nose), says the variations in the frontal sinuses which have been described sufficiently indicate that the passage of the probe through the anterior nares toward the frontal sinus may meet with some opposition. Occasionally a narrow or tortuous duct, or the small size of the ostium frontalis, may prevent the probe reaching the sinus. Beaman Douglass states concerning this point (LARYNGOSCOPE, May, 1904): "One is often mistaken in believing that he has entered the frontal sinus, when, as a matter of fact, his instrument is within an enlarged anterior ethmoid cell" (bulla frontalis). All who have extensively examined the frontal sinus either in the wet or dry state of the skull must have observed that in a considerable percentage of instances an anterior ethmoid cell projects itself into the frontal sinus

either external or internal to the sinus orifice of the duct, and that the mouth of the duct lies partially under such cell. In this class of cases, catheterization of the frontal sinus, when successfully performed, must always result in the entrance of the instrument through the broken down ethmoidal cell wall through which it has been forced. Douglass has, furthermore, pointed out the fact which has also been observed by others, that the internal wall of the frontal sinus, the tabula interna, frequently lies so low above the orifice of the duct that any cutting instrument, even if successfully introduced through the naso-frontal duct, would immediately penetrate the cranial cavity and would most probably set up an effective meningitis. On this point, Mosher states that if there is a sufficient basal relationship between the floor of the frontal sinus and the nose, a burr can be pushed up through the duct into the sinus, the burr running on a probe as a pilot. Concerning this plan of entering the sinus, Mosher further observes that on the cadaver beautiful specimens can be made in this way, but that he is always afraid that the practice of the method will make cadavers of some of his patients. The writer also has a similar fear. The literature of the subject, therefore, clearly indicates that few operators would be willing to place so high an estimate on the percentage of successful cases of intra-nasal enlargement of the duct as does Ingals, who, as previously quoted, states that ninety-five per cent of all frontal sinuses may be safely and successfully entered and drained by means of intra-nasal instrumentation.

It should be stated, however, in justice to the method of Ingals, that his latest instruments and plan of procedure for entering the frontal sinus through the naso-frontal duct are undoubtedly less dangerous than the former ones (Ingals' paper before the New York Academy of Medicine, Section on Laryngology, Dec., 1907), for this operator now passes a guide through the duct into the sinus, next, by means of the X-ray, determines that the position of the guide is correct, and then, when certain that all is safe, drives the burr, which cuts only on its anterior face, along the pilot until the whole course of the infundibulum is enlarged and the sinus is entered.

Unfortunately, the most perfect drainage which it is possible to secure by operative enlargement of the naso-frontal duct, does not always thoroughly drain the entire frontal sinus, and this simple procedure of enlarging the duct will not, therefore, cure every case even though of an uncomplicated, acute variety of sinus suppura-

tion. As evidence of this, several anatomists have especially pointed out the fact that the frontal sinus is often partially and more rarely almost completely divided by osseous septa in such a way as to preclude the perfect drainage of every portion of the sinus, even though the naso-frontal duct be widely open. Thus Hoeve, in an examination of 100 heads (*LARYNGOSCOPE*, July, 1907), states that frequently an internal set of frontal sinuses was normally present, due to the middle sagittal septae being complete. Hoeve further states that occasionally a superior accessory frontal sinus was present in thick skulls, and that frequently posterior and external accessory sinuses were found during these examinations. The writer has seen one posterior accessory frontal sinus, and two external accessory frontal sinuses in cases of secondary operations which he performed because of failure to cure by intra-nasal methods, and he has frequently found the external accessory sinus present during external operations in primary cases that seemed urgently to demand the surgical interference.

It must be clear to every operator of experience that intra-nasal methods of operation upon the frontal sinus are in accord with but one of the several essential principles of successful surgery, viz.: the provision for better drainage; and that even this principle is often violated because of the frequent pocketing of the sinus as a result of the presence of the coronal or sagittal septae within. It would seem, therefore, that it may be justly stated that there are at least three classes of frontal sinus suppuration that can not be cured by intra-nasal methods. These are: (1) Those in which the inner table of the skull arches above the sinus orifice of the naso-frontal duct so closely that, to enlarge this orifice through the intra-nasal route by means of cutting instruments, would almost certainly endanger the life of the patient because of injury to the dura mater at this point. (2) Those cases in which more or less complete sagittal or coronal bony septa within the sinus prevent good drainage, even though a large naso-frontal opening be provided. (3) The cases in which extensive pathologic changes have taken place in the mucous lining or osseous walls of the sinus.

Having briefly shown the limitations of the intra-nasal method of operation on the frontal sinus, when viewed from the standpoint of surgical principles involved, let us next estimate the value of the external procedure when subjected to examination by the same standard.

By following the external method only can the surgeon hope in any satisfactory measure to carry out the surgical principle of removing in an absolutely thorough manner all the diseased tissue involved. It is the method of certainty in this respect, and not one of guess work. No thoroughly trained surgeon is to-day at all satisfied that he has performed commendable work in the removal of diseased structures unless he actually sees, and therefore knows, that he has in no wise disobeyed this first essential of all good surgery. Concerning the dictum that the most perfect drainage should be provided, it will probably be admitted by most operators that the external method of operating on the frontal sinus is superior in every way, for when either the anterior or inferior wall of the sinus is removed, or when both have been resected, as in the Killian operation, every means of access possible is provided for in the removal of all the diseased structures which will subsequently interfere with the outflow of exudates. The external method furnishes, also, conditions which are more favorable than any other to the healing of the cavity by means of healthy granulation tissue, because, as will be subsequently stated, if this method of operation provides the best means of thoroughly eradicating the disease, and establishes a thorough drainage for the operated parts, it necessarily follows that the most ideal conditions are provided for a healthy growth of the necessary granulation tissue.

The application of well established surgical principles to the external or intra-nasal methods of operation for the cure of frontal sinus empyemas seems, therefore, to offer little ground for good argument in favor of the latter plan of treatment after the disease has long since passed the acute stage, or after it is known in any case that the given sinus consists of a series of compartments, rather than of a single, smooth cavity, all parts of which drain, funnel-like, towards the infundibular orifice.

Which of the several methods of external operation is most ideal when viewed from the standpoint of the application of correct surgical principles? The writer has had most experience with the Killian operation, and with the open method. The procedure devised by Prof. Killian seems more in accord with good surgical principles than any other method in which the external wound is immediately closed, and therefore if a primary union of the external wound is intended it should be the method of choice. This operation is also desirable for the reason that a minimum of scar is produced. Although the Killian operation is ideal in many respects, and especial-

ly is this true when the anterior ethmoidal cells are diseased, the writer believes, judging by his own limited experience, that when radical surgery is indicated in the cure of frontal sinus empyema, the desired end is often most certain of attainment by following the so-called "open method" of treatment:—that which has been advocated and extensively practiced by Coakley:—for by this method greater opportunity is offered the surgeon to provide and maintain throughout the whole course of the treatment, the most perfect drainage; to foster by the art acquired by his experience, the natural growth of the necessary granulation tissue: and should perverse or freakish behavior of the granulation structures at any time become manifest, to at once correct and restore the same to a satisfactory and normal state.

The probable deformity resulting from the open method, has, of course, been an insurmountable objection to its employment in the treatment of frontal sinus suppuration, but the writer believes that a careful and prolonged experience in dealing with the processes involved in the healing of osseous wounds, such as the accessory sinuses, by means of obliterating them with healthy granulation tissue, will, in great measure, enable the surgeon to avoid ugly and greatly depressed cicatrices. Perhaps nowhere in surgery does experience count for more in securing esthetic results, than in the case of closure of an osseous wound by the open method. The surgical principle will presently be stated that over-pressure will stunt or kill granulation tissue. Hence if the gauze packing which is commonly used in the treatment of the sinus by the open method is inserted with too much pressure, even though slight, the filling-in process is lengthened to such an extent that the epithelial structures will probably cover the surface of the wound before the granulation tissue has arisen to the skin level, in which event a depressed scar is the inevitable result. A similar outcome may likewise occur from an undue energy on the part of the surgeon in a too excessive or a too frequent repression of the granulation tissue by means of cauterization. A study of this class of wounds during the healing process, and especially a study of the habits and behavior of granulation tissue is, therefore, a very necessary part of the surgical technic, and should provide a satisfactory means of avoiding ugly scars, in many instances, at least.

In a personal experience of more than 500 mastoid operations, and eleven frontal sinus cases treated by the open method, the entire after treatment of which the writer carried out in nearly every

instance, opportunity was offered for rather conclusive observation concerning the behavior of granulation tissue under almost all conditions that are likely to occur during the healing of open wounds. The observations thus made have been of great service to the writer in securing a more rapid closure of the frontal sinus, and in avoiding to a great extent the resulting depression and ugly scar. The conditions under which healthy osseous granulation best thrives were noted, as well as the states of the wound which were most favorable to over activity and necrosis of the granulation structures. The growth of this tissue in osseous wounds as thus observed seemed often freakish, and its behavior such that a useful interpretation of the same was frequently impossible. Nevertheless, in the majority of instances its development was most natural and vigorous under the following conditions: (a) When the wound was sterile, or, at least, in a great measure, approached a state of sterility. (b) When the granulations were moistened only with the exudates which were present, but were neither submerged in secretion on the one hand, nor too greatly desiccated on the other. (c) When there was at no time a too pronounced or too prolonged pressure from the gauze or other dressing which had been inserted into the cavity. (d) When the primary operation on the sinus had been thorough in every respect, and the operated osseous wound had been left smooth and free from any pockets capable of retaining subsequent secretion.

With a thoroughly prepared osseous wound as above described, clinical observation teaches that the subsequent behavior of the granulation buds may be entirely controlled at the will of the surgeon, who may, by means of gauze packing or the application of caustics, repress the growth of new tissue, if he so desires, until the whole cavity has been covered with epithelial structures, and the wound has entirely healed, leaving a maximum of depression and scar tissue. On the other hand, it is entirely possible, in most instances, at least, to secure in a satisfactory way, a type of vigorous granulation structure which will rapidly obliterate the sinus by filling it in to a level with the skin structures, which latter are then, and not till then, allowed to bridge across the wound. Healing of the sinus by the open method of treatment will, therefore, leave a minimum of depression and scar tissue, provided the surgeon will exercise that control over the granulation structures which experience has clearly shown may be exercised almost at the operator's will. This desired pliability of the new tissue is based

almost entirely upon the surgical principles of efficient drainage, absence of undue pressure upon the granulation buds, and a properly prepared wound to begin with.

Clinical observation of the processes of the healing of bone wounds by granulation also teaches that if adequate drainage is provided, and the wound is secured against exposure to outside pathogenic bacteria, a sufficient degree of sterility will usually be secured to encourage rapid and successful filling-in of the cavity. The surgical principle involved in the provision of such ideal drainage for this class of wound will also insure against the accumulation of exudates and the consequent harmful flooding of the new tissue. In sinus surgery, therefore, successful restoration of the cavity, or its complete obliteration, need scarcely be expected in any case in which the external wound is immediately closed, unless the operator is absolutely convinced that the drain canal he has provided is ample to insure against retention of fluids and the inevitable infection of the same, should they be permitted to stagnate. Even though such an ideal drainage is established at the time of the operation, if immediate closure of the wound is practiced, two things may speedily happen to cause failure to cure. These are, first, the too rapid closure of the drain canal by granulation tissue, and second, the formation of pockets through faulty behavior on the part of the granulation and the consequent retention of pus in the sinus, even though an adequate drainage canal remains intact. This latter condition is one which, in the writer's opinion, is responsible for the failure in many cases which have not improved, and in which secondary operations have, therefore, been necessary. It has already been stated that the behavior of granulation tissue, even when all conditions are apparently normal, is sometimes freakish and unaccountable. For example, the writer has often observed during the post-operative treatment of open wounds in the several head sinuses, that occasionally when all had been progressing perfectly well, if the patient be not seen for thirty-six or forty-eight hours, granulations of unaccountable size would spring up in some part of the wound and grow toward similar granulations in another part with such amazing rapidity, that adhesion between the opposing buds took place, a wall was constructed across the healing cavity, and, before the surgeon was scarcely aware of what has occurred, some portion of the wound was already badly drained, the granulations rank and perhaps necrotic, and unless the faulty conditions thus established were promptly corrected, failure to heal

the wound was inevitable. Of course should such an occurrence take place in an open cavity, every part of which can be inspected at any time, failure should not result, because the error is easily detected and corrected; but when the external wound has been immediately closed at the time of the operation, or when intra-nasal drainage only has been practiced, the surgeon can only surmise what is going wrong, and is, therefore, helpless to correct any freaks of healing by granulation, except by means involving a secondary operation.

323 North Delaware street.

Disease of the Scar after Radical Operation. ALEX. IWANOFF.

Archiv f. Ohrenheilkunde, May, 1906.

Three cases are reported. In one a cyst containing bloody fluid formed in the scar, which refilled after evacuation, and was finally cured by thorough curettage. In the other two cases, cholesteatoma appeared, associated with mycosis. They were cured by appropriate treatment.

YANKAUER.

Counter-Rotation of the Eye-Ball Associated with Disease of the Labyrinth. ROBERT BARANY. *Archiv f. Ohrenheilkunde*, May, 1906.

The author investigated the counter-rotation of the eye-ball which occurs when the head is held to one side. He constructed an elaborate apparatus for measuring the position of the head, as well as of the eye-ball, with great accuracy. He examined a large number of persons; normal subjects, patients suffering from disease of the internal ear, and others with labyrinthine symptoms. While the amount of counter-rotation in normal subjects was found practically constant, his conclusions concerning diseased conditions are as follows:

(1.) In unilateral disease of the vestibule, such measurements are of no value. (2.) In bilateral disease of the vestibule, an abnormal degree of counter-rotation can be regarded as only confirmatory of other symptoms. (3.) In patients complaining of vertigo, an abnormal degree of counter-rotation indicates disease of the vestibular apparatus. Normal counter-rotation indicates that the vertigo is due to a neurosis or to simulation.

YANKAUER.

THE OPERATIVE TREATMENT OF SUPPURATION OF THE FRONTAL SINUS.*

BY ALBERT JANSEN, M. D., BERLIN, GERMANY.

Mr. Chairman and Fellows, Academy of Medicine:

I thank you sincerely for your kind invitation to read a paper before your distinguished Society, and ask your kind indulgence in my manner of expressing myself in your language.

The change of dates of which I was not aware-until yesterday did not permit me to have the translation early enough to read carefully and to become familiar with it.

Through the courtesy of one of your members, Dr. Emil Mayer, I have had my paper translated, and it is but an hour or two in my possession.

I present to you my experiences in the operative treatment of chronic suppuration of the frontal sinus.

The healing process of abscess conditions of the frontal sinus is oftentimes delayed because of the complications in the shape and form of the cells, the many varieties in form and size, and from time to time the extraordinary complications of the ethmoidal cells. For this reason it is very difficult by one method of operating to relieve the conditions existing. To produce a curative effect, and still to keep a cavity in chronic suppurations is extraordinarily difficult. To perform a radical operation of the accessory sinus by way of the maxillary antrum, as was recommended by myself in the International Congress in Moscow in 1897, and there demonstrated, I suggested to enlarge the duct of the frontal sinus by removing a great part of its inferior wall. This relieved the suffering, but suppuration still remained.

My method developed in the following way: In an address presented to the German Otological Society in 1893, I stated that as almost always, in chronic suppuration, the frontal and ethmoidal sinuses were diseased, and often the sphenoid, all of these cavities should be opened at one time, from one opening. The anterior wall of the frontal sinus was generally kept intact, but on the other hand, the inferior wall was removed, and sometimes a small portion of the anterior wall. Then I removed the whole of the eth-

*Read by invitation before the Section on Laryngology and Rhinology of the New York Academy of Medicine on May 23, 1908.—For complete discussion of this paper, see *THE LARYNGOSCOPE*, August, 1908, page 667.

moidal and increased the opening of the sphenoidal sinus. The external incision is always made beneath the eyebrow. In consequence, the after treatment was of long duration, and there were many and lasting disturbances of the eye, above all double vision, dislocation of the bulb, squint, and much disfigurement.

The after treatment was made much shorter by the removal of the anterior frontal wall, but on the other hand this induced more disfigurement. The removal of the supra-orbital margin produced much bulging of the eye. Diminished vision and double vision remained sometimes for years, and in the meantime the depression of the anterior wall was often enormous.

In order to improve the cosmetic effect and also to hasten the healing process, I made a flap of the bony periosteum of the anterior frontal wall, and after thorough cleansing of the cavity pressed this into it. As the anterior bony sinus wall is often very thick, we can at times get splendid results by this method. In order to improve the appearance, as also the function of the eye which I here attempted, I made a movable small bony periosteal flap out of the supra-orbital ridge in connection with the upper lid. At the conclusion of the operation, I attempted to make this marginal bony periosteal flap assume its original position as closely as possible. — This unfortunately was not always possible, as in all these methods the wound was kept open for future dressings. At times but *one* of these flaps was made, but as a rule *both*. Generally I begin the operation by making a marginal flap; and through this make it easier to form the bony periosteal flap of the anterior frontal sinus wall. The operation was performed as follows:

The original opening of the sinus was made just over the margin, not far from the median line, with a small chisel or drill, and extended parallel to the supra-orbital margin, with a Stille's bone forceps or burr or chisel, or a small griller; then the margin was chiseled through on the lateral and median border and broken down, together with a part of the inferior wall, and then the lower wall was removed. The separation of the bridge follows much better by means of a diagonal sawing, so that the parts may be easily readapted. After making the marginal bony flap it was quite easy with the burr to make a gutter on the lateral and medial edge of the anterior wall from within to the upper limit and to the periosteum, when possible. With the broad bone forceps the anterior wall is quite easily broken through to make the bony periosteal flap. I followed this method for years, in fact, up to 1903 and 1904, and often obtained

very satisfactory cosmetic effects. As I always treated these by the open wound method the results, however, were not so good as are obtained by primary closure of the wound with sutures. I present herewith an illustration of the results obtained.

A decided advantage is obtained by primary suture, following the suggestion of Killian. The advantage lies in the greatly reduced time of after treatment, and in the absence or short duration of eye complications. I held out for a long time against primary suture. We always operate in infected wounds. Should the material of infection come from the frontal or ethmoidal cavities between the sutured edge of the wound, the possibility of infection of the lymph canals in the skin is very great, and the danger of an erysipelas is imminent. By very careful attention this danger may be met, and on the slightest indication the edges of the wound should be opened. Having found the advantage of primary closure of the cavity, I then took up a second new suggestion of Killian, namely, the formation of a solid bridge of the supra-orbital margin. I am very much pleased with the results. To obtain the bridge in addition to the use of my method of forming a bony periosteal flap does make the operative technique much more difficult, but the results in maintaining the anterior frontal sinus wall as a bony flap are so much better in a cosmetic point of view, that I recommend it most highly, and do not feel that I could give it up. Through the bony gutter over the margin that I have made I now introduce the burr along the lateral and medial margin of the anterior wall as deep into the bone and as high as possible. This formation of the subcutaneous flap, or limitation of the anterior frontal wall, requires great care. The posterior bony wall of the sinus must not be perforated. This, however, is not so great a danger, as the burr does not wound the meninges, that is, unless too small a burr is used. Having made the gutter of the anterior sinus wall on the lateral and medial sides as high as possible, I then introduce a bone forceps on either side and fracture the wall upwards. At times it becomes possible to use the entire sinus wall as an only flap, but often there remains a bony wall on the upper edge of the sinus cavity, and this is removed with the chisel. The flap is very difficult to make if there are recesses, or if the bone is very thick. In very large cavities the formation of the bony flap is made much more easily and thoroughly when a second vertical incision is made on the lateral end of the curved incision. This vertical incision is always made in lateral fashion from the frontal

sinus, running up the skull, so that the cicatrix should not fall into the depression. The incision runs alongside of the lateral frontal sinus edge. Now it becomes an easy process to separate the lateral margin by the use of Stille's bone forceps. The upper part is now drilled with the burr, so that the anterior wall may subsequently be readily broken by the bone forceps. The cicatrix of this incision is barely noticeable later, but the method is made very much easier thereby. This vertical incision is seldom used. I have operated all suitable cases by this method since 1904, that is, 350 cavities in over 300 patients; the result has been entirely satisfactory both to my patients and also to myself. I present to you herewith a photograph of a patient at the time of operation and two days after. In this instance there was a very large and deep frontal sinus, and the result is, as I may mention, just the same subsequently as in the present photograph. This method then is a combination of my original radical operation with the two new suggestions of Killian, namely, the bridge formation and primary suture. According to the other above-mentioned methods I have performed about 500 operations on the frontal sinus, making a total of about 800 operations.

It seems to me more important to enumerate the disadvantages than the advantages of a method. Thus we must bear in mind the opening of the anterior cerebral fossa, the opening of a healthy sinus of the other side, the remaining of infectious material, sequestration of bony flap or bridge, the difficulty of performance, and especially the increased danger of infection as a result of the long use of the electric drill. I make use of the burr to form the bridge and to smooth the same, to remove the lower sinus wall and to smooth the posterior wall. All these dangers may be prevented, except the formation of necrosis, which occurs very rarely. The formation of the bridge alone is often sufficient to start the recurrence; especially on the medial edge a cavity remains that is filled at times with granulations, discolored granulation tissue, and a development of these discolored granulations is often noted along the bridge; these granulations grow either from the nose, below the bridge, or from the medial ethmoidal cells at the base of the nose.

The bridge of Killian at times prevents the free opening of the lower part of the frontal sinus and the proper removal of the ethmoidal cells. The technical difficulties may at times in complicated cases become extraordinarily great; this is the part of the

operation that may be even dangerous to life. I use the burr even more than formerly.

Of the greatest difficulty is the removal and exposure of small ethmoidal cells that lie posterior to the radix nasi and to the frontal sinus. The further backwards and laterally the inferior frontal sinus extends, the more difficult is the exposure of these ethmoidal cells, especially as they occur, as a rule, in a very flat form. They are always diseased, and their exposure is necessary. I have seen death follow as a result of diseased conditions following non-exposure of these posterior cells.

The timidity at first becomes less when we bear in mind the exactness that is necessary here to remove all diseased conditions rapidly, surely and thoroughly.

May I again call attention to the fact that the bone of the base of the cranium is hard, solid, thick, non-translucent, and of a yellowish-white color. The bone covering the ethmoidal cells, however, is thin, transparent, and has a bluish appearance because of the underlying diseased mucous membrane. A slight touch of the chisel, the curette or hook is quite enough as a rule to perforate the bone. This is a most important point by which we can differentiate the bones of the ethmoid or accessory cavities in general as against the bone of the cranium, which latter never shows a bluish hue. In the removal and curetting of the ethmoidal cells at the base of the cranium quite some force may be used, the cranium readily withstands it, and the ethmoidal cells are rapidly and thoroughly removed thereby. Rather frequently there are found in the upper portion and on the side of the root of the nose, median ethmoidal cells filled with diseased mucous membrane, communicating with the other side. The exposure of these cells becomes more difficult when the bridge is formed, and is still more difficult the broader the medial edge of the bridge is maintained. This region, gentlemen, I studied with care.

If certain cells are left behind, recurrence begins here along the bridge or below my bony periosteal flap, or, as may also happen, and as I believe to have noted myself, an infection of the opposite side. I have learned in late years that the cells may be freely removed in this vicinity, even though it is known as the dangerous zone, as a result of the closeness to the lamina cribrosa and to the nerve and lymph tracts. After a thorough removal of all ethmoidal cells in this area, sometimes the conditions are favorable for recurrence, nevertheless.

To avoid sequestration of the bridge the periosteum is left adherent. Operation is made more difficult thereby, as after the cutting of the periosteum above the margin hemorrhage occurs, which renders the separation of the bone above the margin much more difficult. To find the exact point of the beginning of the bony gutter is thereby rendered more difficult. The operation is rendered less difficult if the whole periosteum is drawn up from below over the margin at one effort. If one desires to make the operation an easier one it would be well to follow this plan.

The burr has been of much benefit in smoothing the bony flaps, and if anywhere there is a diseased bony substance shown by hyperemia and roughness of the surface in the frontal sinus, I smooth it in careful manner with the burr.

Perhaps I do not take up too much of your time in calling your attention to the few other points in relation to some of the unlooked-for difficulties of the operation. It is very rare that we find a smooth and regularly built cavity. Most frequently the upper medial recess is separated from the rest of the frontal sinus by a bony partition. Very often there are a number of bony walls mostly vertical, at times also horizontal, by means of which the entire cavity has separate partitions. The formation of my bony periosteal flap is made much more difficult as a result of this, and oftentimes it may only be made by means of the lateral vertical incision. Then these walls may readily be removed by means of curette, chisel, burr and Stille's bone forceps. In a high square cavity this cut is very practical.

An incorrect idea of the size of the frontal sinus may follow because of the division of the sinus in two parts, one above and the other below the margin. This occurs as a result of a horizontal bony wall, which lies on a level with the bridge, usually before its lowest edge, and showing only on its medial end a small opening between the upper and lower frontal sinus division. The formation of the upper frontal sinus is rarely quadrilateral, usually three-cornered, with a more or less rapidly descending lateral wall, and in this form there is also difficulty in forming the bony flap. *This bony wall is at times very thick.*

Recurrence and many annoyances may be occasioned by the presence of a recessus, which occurs at times in the upper region of the septum. I am enabled to show you in this illustration such a recessus accidentally found. Superficially examined, this would look as if a perforation existed to the other frontal sinus. The ex-

tension of the diseased frontal sinus over toward the healthy one is an annoyance, the operation being made more difficult thereby, although we have seen in some cases of this extreme projection prompt healing by first intention retaining the entire anterior wall. The upper and posterior ethmoid cells sometimes bulge into the frontal sinus. These must not be mistaken for an irregularity of the capsule of the cranium, as the opening of this bulging ethmoid is of great value toward a definite and rapid recovery. The thin, bony covering shows it easily as belonging to the ethmoid cells.

Formerly I began the opening of the frontal sinus above the margin; now and for a long time I rarely begin in this manner. I begin almost always to open the ethmoid cells from below; in this opening, after the removal of a part of the processus frontalis of the maxillary bone and the lamina papyracea, I open the lower frontal sinus cavity by the removal of the lower wall of the frontal sinus. It is not always easy to tell in advance whether in the removal of the bone on the medial and orbital border the frontal sinus has already been opened or we are still in the ethmoid region. Mistakes have frequently occurred and are very possible. It is not always possible to locate the frontal duct from this point, and I have not always been able to follow it. As a rule it may be decided by means of the probe whether we are in the large ethmoid cells extending under the frontal sinus, or in the lower portion of the sinus itself. Except for these difficulties the opening from below has its distinct advantages. We must not, however, go too close to the margin, lest we may interfere with the bridge which we wish to form. If the frontal sinus is healthy a small opening may not do harm.

Up to recent times we knew nothing about the form and shape of the sinuses before the operation. By means of the transillumination we got a sort of a rough idea. But of late years by means of the Roentgen rays we have been enabled to get a clear idea of the form, size and position of the frontal sinus, but even now at times it becomes very difficult to determine, even with a very good Roentgen plate, whether a sinus exists or not. To be very exact, we must have also a frontal and two transversal illuminations.

Operating from below, we come to the conclusion very rapidly. By superior operation above the margin we are often compelled to chisel away very deep in the skull before we reach the conclusion that there is no frontal sinus. The disappointment, after many un-

satisfactory attempts disclosing a healthy dura in place of a diseased mucous membrane, is exceedingly depressing.

Another point of great value in favor of operating from below is that it occurs not infrequently that a diseased condition of the mucous membrane of the frontal sinus in the floor of the sinus is disclosed. This is a point of great importance for the diagnostician as also for the operator. We have all suffered under the difficulty of forming an exact diagnosis of the condition of the frontal sinus, and oftentimes we could not reach conclusions without doubt. In many cases we believed ourselves to be entirely sure, sure of a diseased condition of the mucous membrane without a doubt, and then when the opening was made above the margin we saw an empty, healthy frontal sinus cavity, and, gentlemen, we really were not so wrong as it would seem at the first glance. The frontal sinus was in its upper portion normal, but not always entirely, and in its lower portion was often found to be very seriously diseased. We must therefore in the frontal sinus not only think of the conditions as existing in the upper portion, but also of the conditions in the lower. According to my experiences the prevalent diseased condition of the mucous membrane on the floor of the frontal sinus is not so unusual as it would seem to be from the lack of mention thereof in the literature of the subject. These conditions are very often possible of demonstration after the opening of the lower portion of the frontal sinus. In such cases the mucous membrane on the posterior frontal sinus wall is less reddened and swollen in the region of the margin, and appears at times quite white and thin and shining. If the mucous membrane in the neighborhood of the margin is healthy or nearly so, we may be quite confident of a cure as a result of operation. Chances of recovery are still greater in these cases than if we made a counter opening above. My experiences as to what is useful and harmful are still too few to enable me to reach a definite conclusion, but I would like to call attention to the fact that I have seen an almost normal frontal sinus above the margin with diseased cavity below, followed by severe affection of the upper portion after having made a probatory opening above the supra-orbital margin—and have seen prompt recovery follow the opening of the lower portion of the frontal sinus, if I thoroughly opened and cleaned out only the inferior cavity. If the upper portion above the margin is found to be normal we must not therefore cease operating, that is, if an indication

for operation previously existed. We must then open up the lower portion, or better still, we begin from below to open up.

We may anticipate these conditions by the use of electric transillumination and the Roentgen rays together. If the transillumination shows more or less darkening in the vicinity of the supra-orbital margin, and above and below the margin, large cavities are diseased. These cavities may represent a very large lower frontal sinus recessus, or below a small sinus a large ethmoidal cell. If the upper sinus is healthy, the Roentgen picture in such a case would hardly show a shadow as in general the upper portion showed it. If, however, the upper sinus in the Roentgen picture is hazy and dark, and if there is a rather negative find in the transillumination,



we are justified in concluding that the lower recessus is small and surrounded by a healthy ethmoidal cell.

I would like to call attention briefly to another difficulty coming as a surprise in the operation, but for which as a rule we are prepared. I refer to the existence of a perforation of the septum with disease of both frontal sinuses, while but one side was diagnosed as affected. This occurs particularly in cases of one-sided discharge and closure of the other frontal sinus orifice, for instance, by ossification. We become suspicious of this condition, however, when by transillumination there is an equal absence of light on both sides, or when on the Roentgen plate both sides are equally shaded; sometimes the X-ray profile plate gives us ample knowledge before operation. If the relations of the ethmoid and sphenoid, even of

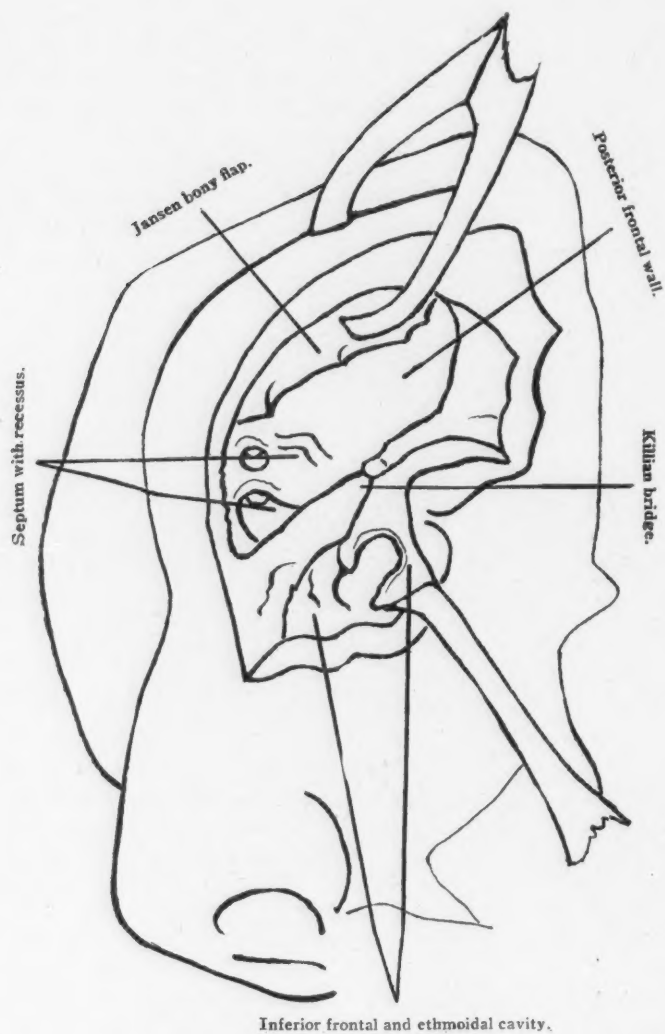
the frontal cavity, are not too difficult, the operation of both cavities from one side is the most practical. I remove the septum, as a rule, even if the other ethmoid side is normal, draining the cavity through the ethmoid. The retention of the septum often practiced by me in cases of double abscess disease may be of advantage from the cosmetic point of view, which the formation of the nose and forehead will show.

The ethmoid is extraordinarily variable in form and size. Even in the greatest extension of the ethmoid I have been enabled to remove it entire. This I consider as a necessity to secure an assurance of complete cure.

The sphenoidal sinus is affected with extraordinary frequency in disease of the ethmoid, but not absolutely always. A careful inspection is necessary, but unfortunately, on account of the excessive hemorrhage that occurs, this is more easily said than done. Nevertheless, in many cases we are enabled to note the condition of the sphenoidal sinus with some exactness. If it is diseased I remove the whole anterior wall of the sphenoidal cavity. This is done with the aid of long gouges and curettes. I follow with extraordinary care the sphenoid cavity to its final lateral end. For a long time, however, I have not been satisfied with this alone. In the after treatment much difficulty arises because of the closure of the sphenoidal wound, where the wall was removed, by a membranous band becoming ossified. This retards recovery, and to prevent this I have not only removed the anterior wall, but also the lower wall. This removal of the lower wall is much more difficult than the anterior, as the bone of the lower wall is very much thicker and at a greater depth.

So for a long time I have often included the opening of the maxillary antrum with the opening of the ethmoid cells through the same wound. After the removal of the ethmoids, the opening of the maxillary antrum is exposed, and very frequently is clearly seen in all its breadth. In this way the medial maxillary antral wall is readily removed with the curette, followed by the use of the gouge, and thus the granulation, polyps and thick pus masses may be removed from the maxillary antrum without opening the same anteriorly. In many cases this is of advantage, though I will not recommend it in that the affections may not be followed by complete recovery.

A word should be said on the relations of the middle turbinate. In most cases I do not remove the middle turbinate. It remains



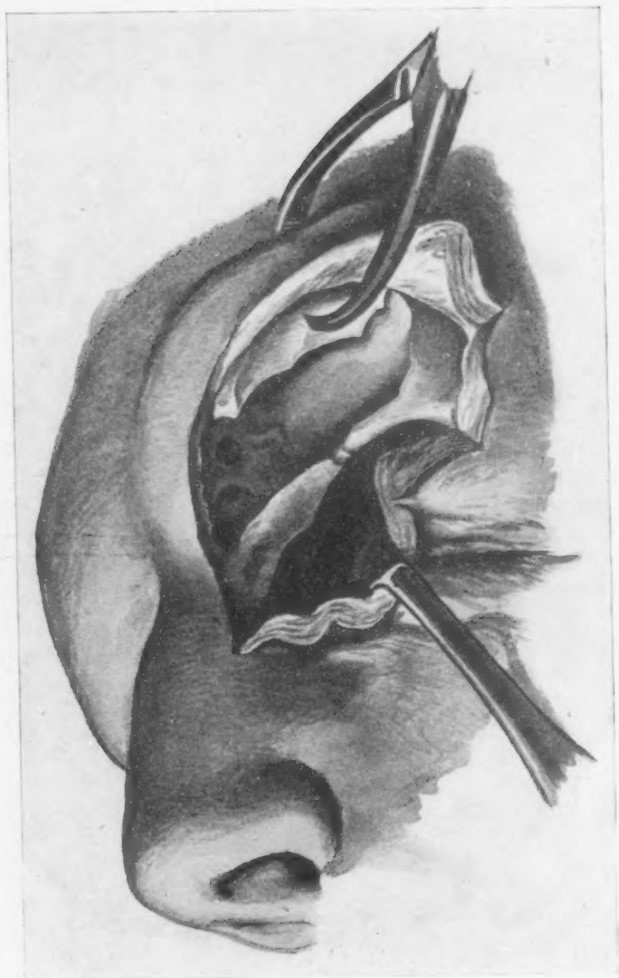


Plate illustrating Dr. Jansen's technique of the radical frontal sinus operation.

if not degenerated, and where I wish to preserve the sense of smell. In those cases where I wish to retain a thorough view of the ethmoid, frontal and sphenoid region I remove the middle turbinate.

As regards perforation into the cranial cavity, this occurs extraordinarily rarely in my cases. I have had it occur a few times, but saw no reason to modify the method of operation. I recall one case of perforation from the frontal sinus, and also from the ethmoid into the cranial cavity with pachymeningitis externa. I was enabled to free the diseased dura from the healthy part, curette the granulations, and conclude the operation as in all the others, but without complete primary closure. Recovery was prompt, but the primary closure of the wound was not attempted. In such cases the marginal bony flap may be used advantageously.

After concluding the operation the parts are thoroughly cleansed of blood and splinters of bone, any diseased mucous membrane is removed, and iodoform gauze is introduced. The latter, in order to prevent pressure upon the bulbus, is made long and small, then follows the closure of the wound with the Michaels metallic clamps. As a rule, after twenty-four hours, and sometimes only twelve, I remove the clamps and gauze through the nose, satisfying myself that the upper end of the gauze, which was hemmed, was removed. It has happened that the gauze strip has become torn and the upper edge remained in the wound; after a few weeks an abscess occurred, requiring opening up and removal. This has recurred sometimes, and at first I did not understand its meaning, believing that the gauze was left behind at time of operation, and only accidentally found that the gauze was torn in removal. By sterilizing this with superheated steam the gauze becomes soft, and hence tears easily. I then have a bandage placed, and leave this for eight days, so as to exert pressure on the bony flap against the underlying part. Further treatment is not necessary. I do not wash out the nose for some weeks.

I apply the different methods of operation—it is always the radical operation on the frontal and ethmoidal, often also the sphenoidal sinus—according to the following indications:

I. With young children and adults having a very small frontal sinus, no plastic procedure being necessary, I remove the anterior and inferior wall, including the supra-orbital margin; a procedure for a great many years practiced by me; my old operation.

II. With older children or adults, having somewhat larger cavities, I perform the operation by forming the anterior bony flap, according to my procedure practiced for several years.

III. Should the cavities be still larger (though in any case small), I form the Killian bridge, removing the anterior and inferior wall and, if necessary, filling the cavity with a piece of paraffin.

IV. Should the cavities be rather extended, I form both the anterior bony flap and the Killian bridge. This is my standard operation since 1904.

V. I form two bony flaps, the anterior and the marginal, if primary closure is impossible, as well as a solid bridge, for instance in endocranial abscess, or in phlegmon, or if the operation must be performed as rapidly as possible (in weakness of the heart, etc.). The same method is indicated if the operator's experience should be insufficient to overcome the difficulties accompanying, in extraordinary anatomical conditions, the formation of the Killian bridge.

Hardenbergstr. 12.

A Case of Neurofibromatosis (Recklinghausen's Disease) with Involvement of the Ear. VICTOR HAMMERSCHLAG. *Monatssch. f. Ohrenheilkunde*, May, 1906.

In addition to the neurofibromata scattered throughout the body, there was present in the case reported by the author a subcutaneous angiomatous tumor in the temporal region and cheek of the right side, and a defect in the alveolar process of the right upper jaw. Radioscopy showed that the bones of the right side of the skull were exceptionally thin and the accessory cavities large.

The condition of the right ear is of especial interest. There was an entire absence of the cartilage of the external canal and tragus, so that the cartilaginous part of the canal was collapsed, and at its junction with the bony part there was stenosis. There was diminished hearing, especially for low notes. Weber right, Rinne positive. Catheterization improved the hearing, but the procedure was difficult, as it was not always possible to find the orifice of the tube with the catheter. The author believes that this was due to an absence of the cartilage of the tube. A certain asymmetry of the vault of the pharynx and of the soft palate seems to substantiate this view.

YANKAUER.

SOME VARIATIONS IN THE ANATOMY OF THE FRONTAL SINUS.*

BY JOSEPH P. TUNIS, A. B., M. D., PHILADELPHIA.

The greater the number of specimens examined the more one is impressed with the wide variation in extent and capacity of the frontal sinus. Among over a hundred human skulls which I have recently examined, the capacity varied from 1.2 cc. to 28.4 cc with all possible intermediate gradations. In this series of one hundred anatomical specimens, the sinus was absent in only one. (Fig. 1.)



Figure 1.—No frontal sinus. The outer table of the skull has been removed on the right side to show the diploe.—From a specimen in the Wistar Institute, Philadelphia.

Half of this series was secured from the dissecting room of the University of Pennsylvania, and the other half from the excellent collection of skulls at the Wistar Institute. Included among the latter, numbering one hundred and seventy skulls, were specimens from India, Borneo, New Zealand, China, Japan, Africa and Alaska. Most of the museum specimens I was only able to examine by transillumination. As all of this material represents the lowest possible type of skull, it is fair to presume that such variation would be greater in the higher and more intelligent types.

*Read before the Section on Otology and Laryngology of the College of Physicians of Philadelphia, May 20, 1908.

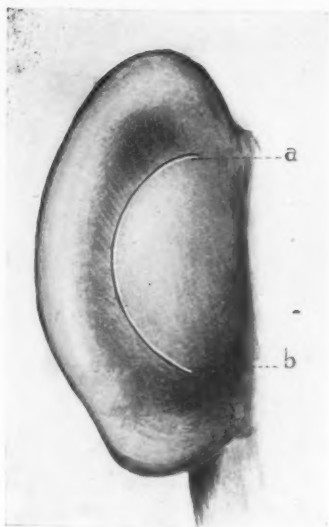


Figure 1.

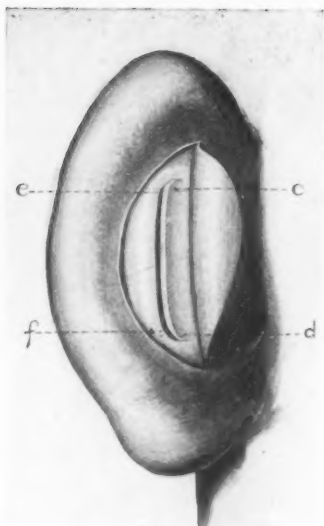


Figure 2.

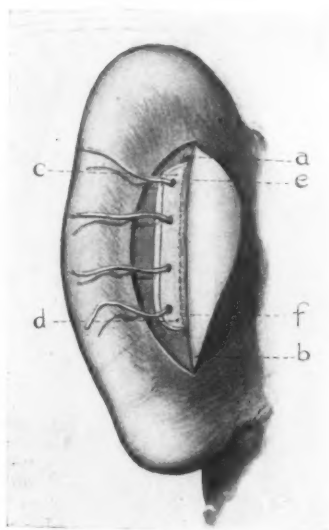


Figure 3.

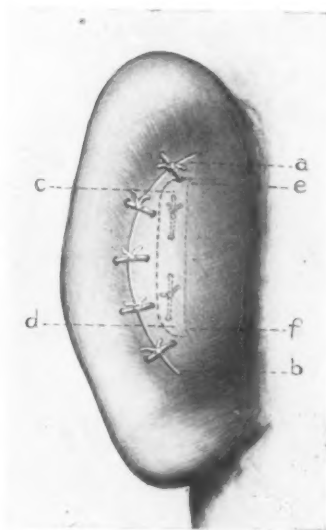


Figure 4.

Plate II.

Author's Operation for Reducing Macrotia.

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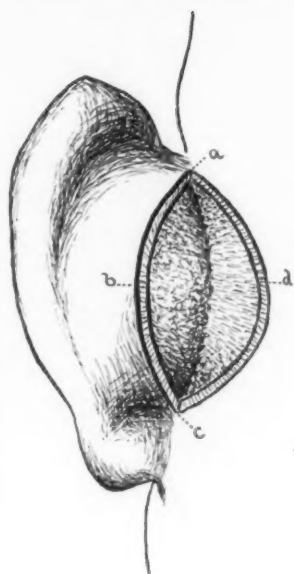


Figure 1.

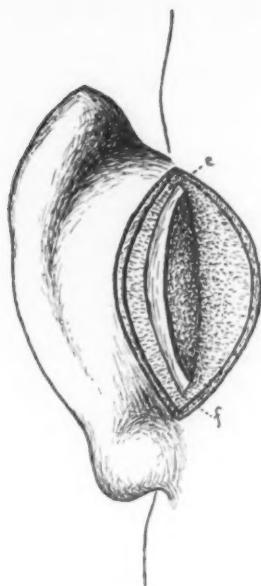


Figure 2.

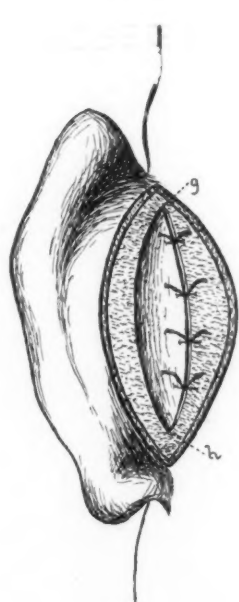


Figure 3.



Figure 4.

Plate III.

Author's Operation for Correction of the Projecting Ear.

THE
JOHN DEERAR
LEGACY.

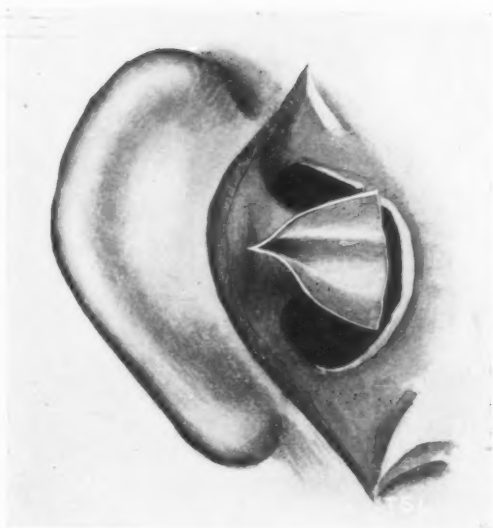


Plate V.
The Stacke Plastic.

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Plate VI.
The Stacke-Jansen Plastic.

THE
JOHN C. REEVE
LIBRARY.



Plate VII.
The Panse Plastic.

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JOHN CRERAM
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Plate VIII.
The Korner Flap

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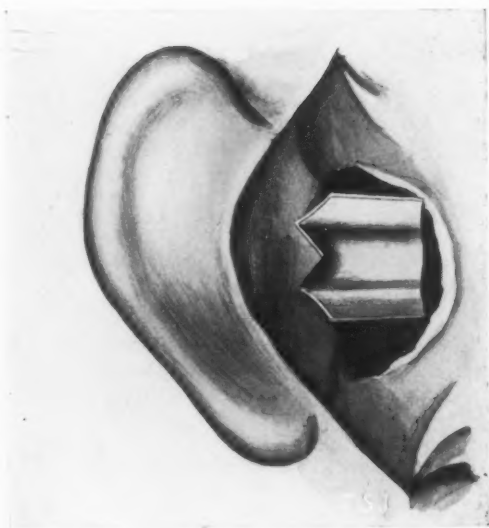


Plate IX.
The Siebenmann Flap.

THE
JURY CHIEF
- ADAMANT -



Plate X.
The Ballance Flap.

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JOHN CHERAM
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Figure 1.



Figure 2.

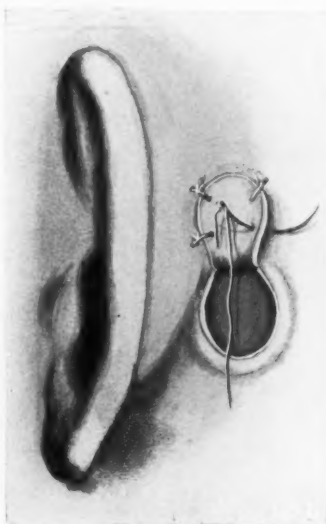


Figure 3.



Figure 4.

Plate XI.

The von Mosetig-Moorhoff Operation.

THE
JOHN CHESTER
ADDRESS

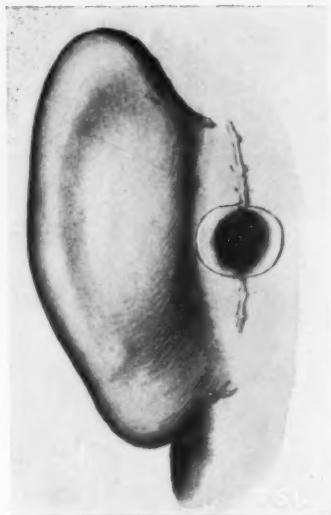


Figure 1.



Figure 2.



Figure 3.



Figure 4.

Plate XII.
The Trautmann Operation.

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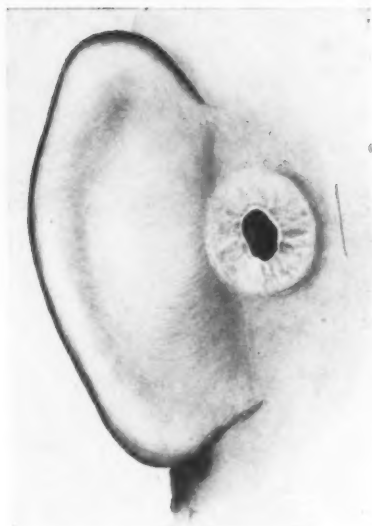


Figure 1.



Figure 2.

Plate XIII.

Author's Retro-Auricular Plastic.

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According to Holden¹ the points of interest about the frontal sinuses are: "1. That they communicate freely with each nostril through the 'infundibulum,' hence it is possible for foreign bodies to lodge there. 2. As they are lined with a continuation of the nasal mucons membrane we have a ready explanation of the aching pain in the forehead in cases of influenza, or a common cold in the head. 3. In cases of fracture of the base of the skull, involving the walls of the cells, it is possible for fragments of the brain to escape from the nose. 4. If the outer walls of the cells be in-



Figure 2.—Sagittal section of adult frontal bone, with ethmoid attached, to show space between anterior and posterior wall of frontal sinus. —From a specimen in the Wistar Institute, Philadelphia.

jured by violence or disease, the air, in sneezing or coughing, is liable to escape under the skin of the forehead; causing 'surgical emphysema.' 5. They not only contribute to the lightness of the skull, but increase the resonance of the voice. They do not begin to be developed until about the second year, and steadily increase in size afterwards. Even in Europeans their size and extent vary exceedingly. * * * In old persons, as a rule, when the sinuses enlarge, it is by the inner table encroaching on the brain-case. The skull wall follows the shrinking brain."

While a resident at the Episcopal Hospital I saw three cases of fracture of the outer wall of the frontal sinus without injury to the inner and more brittle one. One of these was a boy of four

years; the second case a boy of 14, and the third an adult. All three made an uneventful recovery. Such cases are not infrequent in surgical practice, and illustrate the very considerable space or air cushion, antero-posteriorly, between the two walls of this sinus. (Fig. 2.) As to the age at which the frontal sinus develops, I have only been able to examine half a dozen skulls of children; their ages ranging from two to six years. Of these the specimen I show you (Fig. 3) is presumably that of a child from five to six years old, judging from the condition of the unerupted teeth. This child has a well marked frontal sinus on the right side and also a decided sphenoidal sinus. The other five juvenile specimens showed no frontal sinus at all.

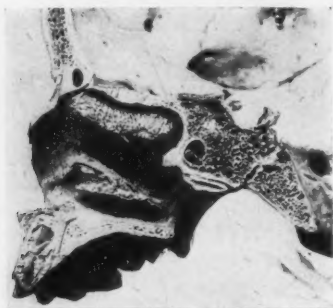


Figure 3.—Sagittal section from a child of five years. Note the frontal sinus, the sphenoidal sinus, the thinning out of the cancellated bone in the sphenoid, and the unerupted canine teeth.

Logan Turner,² from an examination of over five hundred skulls, gives the following measurements for a sinus of average size;—height, 31.6 mm. ($1\frac{1}{4}$ in.); breadth, 25.8 mm. (1 in.); and depth, 18 mm. ($\frac{3}{4}$ in.). Three diameters were taken for this purpose, namely, the vertical height, from the fronto-nasal aperture vertically upwards; the transverse breadth, from the mesial septum horizontally outwards; and the antero-posterior depth, from the lower end of the fronto-nasal suture backwards along the orbital roof. (Fig. 4.) "In estimating the height of an unopened sinus, however, it will be found that the lower end of the suture between the nasal process of the superior maxilla and the frontal bone sufficiently indicates the position of the ostium frontale." "The ostium frontale is always present. This is readily understood when we remember that the

sinus is developed by an upward extension from the ethmoid labyrinth. As the result of measurements which I have made in a large series of macerated skulls, the opening was found to vary from a mere slit which would not admit the point of a very fine probe, to one measuring 7x8 mm. The average diameters were found to be 4x3 mm."

"The smallest cavity met with (by Logan Turner) measured in height 18 mm. ($\frac{3}{4}$ in.), in breadth 13 mm. ($\frac{1}{2}$ in.), and in depth 5 mm." A glance at specimen No. 22 or No. 23 will show that



Figure 4.—Skull No. 9. Outline of a frontal sinus of more than average capacity.

these are much smaller ones. In specimen No. 22 the frontal sinus extended upward and backward half an inch while in specimen No. 23 these measurements were reduced to a quarter of an inch in each direction. Neither of these specimens showed any vertical extension of the sinus above the supra-orbital ridge. The largest sinus (of this same observer) bounded internally by a mesial septum, extended as far outwards as the external angular process of the frontal bone.—Height, 45 mm. ($1\frac{3}{4}$ in.); breadth, 60 mm. ($2\frac{1}{2}$ in.); and depth, 25 mm. (1 in.) A sinus with a greater vertical diameter than the above was, however, met with; its cavity ex-

tended upwards in the forehead for two and a half inches. In another skull, again, the sinus extended backwards almost as far as the optic nerve."

Among my specimens, skull No. 5 (Fig. 5) gives some greater measurements than the largest of Turner's. Unfortunately the calvarium of this skull was missing so that the vertical diameter could not be accurately determined. Laterally the measurement is three and an eighth inches; antero-posteriorly, on the right side, one and three quarters inches; while vertically it extends at least two inches upward. Note the extremely thin anterior wall of this sinus on the right side and the poorly developed supra-orbital ridges. In this specimen there is also a gigantic sphenoidal sinus extending outward to the extremities of the greater wings of that

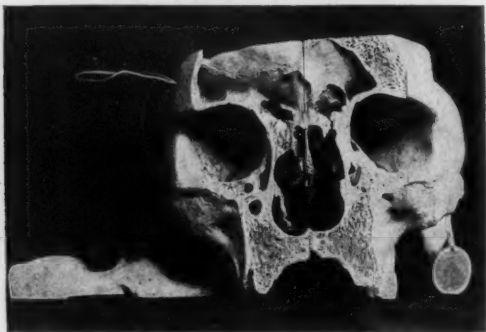


Figure 5.—Skull No. 5, with thin anterior wall to frontal sinuses, extending laterally to the external angular processes of the frontal bone and measuring 50 mm.x37 mm.x50 mm., over right orbit. The combined capacity was 190.3 grams, or 28.4 cc.—From a specimen in the Wistar Institute, Philadelphia.

bone. Unfortunately I have no data concerning this skull. It is merely a dissecting room specimen.

Dr. M. H. Cryer³ has described a specimen where the sinuses were even larger, and Onodi⁴ has an X-ray picture in his book of a frontal sinus which extended vertically 80 mm., or 3 1-5 in. from the supra-orbital ridge to within 4 cm. of the coronal suture. This sinus had the greatest vertical diameter of any I can find reported in the literature of the subject.

In examining the thirty odd specimens I have the pleasure of showing you to-night you will see that there is only a very small sinus on the right side in specimens No. 22 and No. 23. The

actual capacity of the former, measured by pouring in small shot and then weighing it, is 1.2 cc., while the capacity of the sinus in skull No. 5 was 28.4 cc; specimen No. 24 being second best, having a capacity of 16.8 cc. The shot used for this purpose was the smallest I could get, namely No. 12. By determining the equivalent in cc. of each gram of shot it was found that every 6.7 grams of shot were equal to 1 cc. of water. This method of determining the capacity of each sinus renders it an easy matter to make comparisons. Note also the very considerable antero-posterior diameter in specimen No. 24,—three quarters of an inch, and the large ostia. The sphenoidal sinus in this specimen is above the average, with large openings into the superior meatus.

In specimen No. 20 there is a small sinus on the right side and in No. 21 it is only present on the left. No. 25 shows an average sinus with an almost symmetrical septum, No. 26 a well marked horizontal partition as well as a vertical one. No. 27, a fragment, shows an average thin-walled sinus on cross section and the manner in which this air space blends with the ethmoid labyrinth. No. 28 shows a small sinus behind very decided supra-orbital ridges. The ostium on the right is large and patulous while on the left the ostium opens into an anterior ethmoid cell. Specimens No. 29 and 30 show average sinuses behind comparatively smooth foreheads. Thus examples might be multiplied. Almost all of them are asymmetrical.

H. Lambert Lack² says that the average depth, behind the supra-orbital margin, is from 4 to 8 mm. This writer quotes Lothrop as finding both sinuses invariably present in the orbital region after an examination of 250 specimens, but in three per cent the vertical portion was absent. "Logan Turner, in 240 European skulls, found one or both sinuses absent in forty-one; that is in 17 per cent. Among these in 7.5 per cent both sinuses were absent and in 9.5 per cent one sinus was absent. Tilley found entire absence of the sinuses twice in 120 skulls, in one case in association with prominent brows. Kicer found both sinuses absent five times and one sinus absent seven times in 105 skulls. Max Scheier found no frontal sinus twice in 100 skulls. On the whole, the sinuses seem to be larger in males than in females and are smaller and more often absent in races with receding foreheads; but the size of the cavity bears no constant relation to the prominence of the supra-orbital ridge. Developmentally, the frontal sinuses are absent at birth and

up till about the sixth year. They apparently begin to develop as a protrusion from the ethmoidal region at about the sixth or seventh year and slowly spreading between the tables of the frontal bone attain their full size and dimensions at or about the age of puberty."

| Writer: | Skulls examined. | Sinus absent on both sides. | Sinus absent on one side. | Sinus absent on right. | Sinus absent on left side. |
|--------------------|---------------------|--------------------------------------|------------------------------------|---------------------------------|-------------------------------------|
| Lothrop | 250 | 0 | † | | |
| Logan Turner | 240* | 18 | 23 | 9 | 14 |
| Tilley | 120 | 2 | | | |
| Kicer | 195 | 5 | 7 | | |
| Max Scheler | 100 | 2 | | | |
| Tunis | 100 | 1 | 3 | 1 | 2 |
| | 1005 | 28 | 33 | 10 | 16 |

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2. LOGAN TURNER: Accessory Sinuses of the Nose, Edinburgh, 1901.
3. M. H. CRYER: Jour. Amer. Med. Assoc., Vol. XLVIII, pp. 284-289, Jan. 26, 1907.
4. A. ONODI: Die Nebenhöhlen der Nase, Wien, 1905, Tafel 113, Fig. 113.
5. H. LAMBERT LACK: The diseases of the nose and its accessory sinuses, London, 1906, pages 15 to 17.

No. 1426 Pine Street.

*European Crania. †Vertical portion absent in 3 per cent.

A Case of Malignant Tumor of the Thyroid Gland. H. C. KLOPPER. *Medical Fortnightly*, September 10, 1908.

This case of malignant growth in the thyroid, a rare occurrence, was presented to the Medical Society of the City Hospital Alumni of St. Louis. The tumor before operation was diagnosed as malignant adenoma, but examination after death threw some doubt upon this.

In the latter part of her illness the patient, a woman of 71, had severe cough and dyspnea, but no pain. Physical examination showed considerable exophthalmos and a cyanotic color of lips, face and hands. The entire body was covered with a profuse, clammy, cold perspiration. There was edema and swelling of both legs above and about the ankles. No operation was attempted.

EATON.

NOTES UPON TWO UNUSUAL FRONTAL SINUS CASES.*

BY J. PRICE BROWN, M. D., TORONTO, CANADA.

Case I.—Chronic Purulent Frontal Sinusitis with External Fistula for Nearly Two Years—Operation—Recovery.

February 28, 1907, Miss M. F. was referred by Dr. Black, of Paisley, for treatment.

History—In September, 1904, two and a half years previously, while attending college in Toronto, she had an attack of fever, resulting in frontal abscess on the right side. This was lanced by the attending physician in consultation. There was a free discharge of very foul pus. Under treatment, healing took place in a month, and she went home to Paisley. Toward Christmas swelling of the forehead returned, and Dr. Black reopened it. From that time until the following March discharge was almost constant, and she was brought to the city again for further advice. The consultants decided that it was a case of frontal sinus disease, requiring immediate operation. Consequently, under general anesthesia, it was opened through the floor, the excision extending up into the superciliary ridge. An opening was also made downward through the region of the fronto-nasal passage into the nose, and an attempt was made to secure nasal drainage. The result was not satisfactory. The fronto-nasal passage closed and the external opening refused to heal. The discharge would sometimes almost cease and again for days come away more freely. Four months later the sinus was still open. Then, to secure more efficient drainage and lavage, the doctor inserted into the opening a short rubber tube, through which the cavity was washed out regularly. It was worn for nearly a year and then discarded. Subsequent to this the patient would sometimes probe the cavity to obtain a better outlet to the pus, or the doctor would make the passage free with the lance. Finally, after having almost continuous discharge for two years, a sudden aggravation of all the symptoms occurred and the patient was referred to me.

Examination.—Left eye almost closed, the eyelid swollen and inflamed, the swelling extending upward over the superciliary ridge and including the inner canthus. The surface beneath the

*Read at the annual meeting of the American Laryngological Association, Montreal, June, 1908.

ridge was irregular, pultaceous and darkly suffused in color, with pus exuding from a point immediately over the site of the sinus operation. There was a good deal of pain over the region, accompanied by headache. An X-ray picture, the one shown to-day, did not reveal much, save a darkened shadow on the affected side, and the opening in the bony wall from the previous operation upon the sinus. There was no shadow in the maxillary region.

Intranasally there was little if any pus visible, but the middle turbinal and a portion of the inferior turbinal were removed. This had to be done under general anesthesia, as the young lady was too nervous to submit to any operative work under local anesthesia.

How to operate upon the sinus was the next question. I was unwilling to attempt a radical operation after Coakley's plan for cosmetic reasons. Killian had not yet visited the country, and at that time I knew little of his operation. At the same time, I was strongly impressed with Fletcher Ingal's intranasal treatment and use of gold tubes. As in his cases, the desideratum of nasal drainage was secured, something which Killian now insists upon as essential; the thought struck me that a gold tube inserted from the frontal sinus downward through an enlarged fronto-nasal passage might be equally effectual. The external wound could then be closed, irrigation would be obtained through the tube, and the latter eventually removed through the nose. So an operation was done under general anesthesia. The eyebrow was not shaved. The incision was made through the centre of the eyebrow from the middle inward to the median line. The periosteum was then raised directly upward over the inner end of the sinus, and a rectangular piece of the outer table chiselled out above the superciliary ridge, the long direction being upward. The object was, while leaving a minimum of deformity, to permit a straight drill to be passed downward and backward to destroy the anterior ethmoid cells, the incision and the removal of the bony wall being entirely distinct from the site of the former surgeon's operation.

A quantity of pus and blood welled out on opening the sinus, the cavity was curetted and freely irrigated. Then, the infundibular point being found, successive hand drills were used until this larger one could be inserted and a free entrance made into the nose, external to the septum and in the region of the anterior end of the middle turbinal. A curved forceps was then passed

downward through the passage and after repeated irrigations the gold tube was inserted from above.

The external wound was at once closed. It healed in a very few days by first intention, but to my chagrin I found it impossible to irrigate the sinus through the tube as intended. The girl had passed through so many operations that she became hysterical the moment an attempt was made to pass any instrument, even the end of a syringe, into the nasal passage. Another point, while the discharge from the old fistula, which I had not disturbed at all, mate-



rially lessened, it did not cease, while it still continued to be inflamed and tender.

Hence, twenty-three days after the insertion of the gold tube, I operated again. This time I made a similar incision to the former one, parallel to it, but below the eyebrow, and directly through the central point of discharge. From the opening two or three bits of dead bone were taken. The outer tissues were then raised over the entire extent of the original operation, the gold tube was removed from above and a large rubber tube inserted in its place; the upper end being curved on itself, to lie on the floor of the sinus, and the lower end extending beyond the nostril. The outer incision was then closed as before.

This time the result was all that could be desired. Although the tissues through which the incision had been made were inflamed, darkly suffused and spongy, the healing was again by first intention.

The sinus was for a time irrigated regularly twice a day with warm sterilized water. The discharge gradually diminished and in a few weeks it practically ceased, when the tube was removed.

From then until now there has been no return of the disease and the patient is quite well. This I think is due to the fact that the wearing of the gold tube for twenty-three days secured permanent and effectual drainage from the affected cavity.

This photograph, taken last month, one year after the operation, indicates how small a deformity has resulted from the operation.

Case II. Traumatic Frontal Sinus Disease—Operation—Recovery.

History—In April, 1907, Mr. J. F., age 35 years, married, received a severe blow from the head of a horse; the region struck was that of the right temple at the outer end of the frontal sinus. After some weeks this was followed by a swelling beneath the right eye-brow and tenderness on pressure. Later on both these symptoms subsided. In the following August, also, he had the misfortune to strike his forehead against a stone wall, resulting in an abscess which was lanced. In due time this healed, leaving a surface depression.

Early in January, however, his head began to be sore, followed by pains in the region of the frontal sinus, shooting backward toward the occiput. This was accompanied by the sensation of fullness and pressure in the forehead on that side, the condition being always aggravated at night time. Toward the end of January swelling beneath the right eyebrow also returned, with marked tenderness on pressure over the central portion of the sinus, while sleep at night became almost impossible. During this period the patient was under Dr. Wilson's care; but medical treatment failing to afford relief, on February 22nd he referred him to me and he was placed in the Western Hospital for operation.

Examination.—Head feels hot continually, temperature ranges between 99 and 100, soils two or three handkerchiefs a day from right nasal hemorrhage, complains of intolerable bursting head pains and entire absence of sleep. There is also drooping of tissues beneath the floor of the sinus and much tenderness on pressure.

The right side of the septum was much thickened and spongy, the anterior end of the middle turbinal also was enlarged. Both were hemorrhagic, but there was very little pus visible.

My first effort was to give relief by intranasal treatment; so, under cocaine and adrenalin, I reduced, by operation, the hypertrophied tissues, but failed either to penetrate the infundibulum or give relief to the frontal sinus.

So, five days later, under chloroform anesthesia, assisted by Dr. Wilson, I did a modified Ogston-Luc operation; that is, after chiseling the usual opening into the frontal sinus above the superciliary ridge, instead of merely dilating the fronto-nasal passage and putting in a small drainage tube, I drilled a larger opening, destroying the anterior ethmoid cells; and placed a rubber drainage tube from the floor of the frontal sinus down through the nasal passage and out through the nostril.

On opening the sinus there was very free hemorrhage, accompanied by purulent matter. The blood vessels were enlarged. The mucus membrane, particularly on the anterior wall, was swollen and spongy, that on the cerebral side of the cavity being little affected. After curetting away freely all adventitious tissue, the sinus was washed out with hot boracic acid solution, then swabbed with peroxide of hydrogen, and the operation completed. The drainage tube was next inserted and lavage repeated both from above and below. Finally the wound was closed by silk sutures and padded and bound.

A swab was taken from the sinus at the time of operation. Examination revealed pus cells mixed with blood. Another swab taken ten days later from the sinus, quite free from blood, proved the disease to be one of pure pneumococcus infection.

Points with regard to temperature. Immediately before the operation the temperature was 99 1-5; three hours later it was 101 1-5, and still two hours later, at eight o'clock in the evening, it had risen to 104½ and was accompanied by delirium. Throughout the night the patient could with difficulty be kept in bed. In the morning the temperature dropped to 101 1-5, the delirium was over and did not again appear. Still the second night the temperature rose to 103 4-5, subsequent to which time it was almost invariably normal.

The respiration throughout was above normal, always between 20 and 25 per minute. At the time of operation it was 24 per

minute. The pulse also from the first was rapid, running from 100 to 120 per minute.

Possibly the rapid pulse and respiration might be due to a general pneumococcic infection with local focus within the frontal sinus. With regard to after treatment, the intention was to wash out the sinus, regularly, through the wide drainage tube, by means of a small-tipped instrument. This was carried on effectually for some days; but possibly due to the high temperature of the first forty hours, the wound did not heal by first intention. The stitches loosened and were removed and the whole wound opened.



Granulation commenced and the lavage was then done through the nose from above; sixteen days after the operation the tube was removed through the nose, and as the sinus wound was closing a small rubber tube was placed at its inner end and the lavage continued. Latterly, no other treatment was followed, save to cover over the small opening of the wound and tube with adhesive plaster, to be replaced after each irrigation. The boracic solution came through the nostril freely and was soon free from pus. By April 16 the discharge from the sinus had ceased, so the little tube was removed, irrigation dispensed with, and the wound allowed to close—the pa-

tient being warned against all nose blowing until entire healing had taken place.

One point is worthy of note as brought out in this case, that is the advantage of a reversed Valsalva in cleansing the fronto-nasal passage during the process of healing. While the little tube was in situ in the forehead, although there was no external discharge whatever, the air would whistle through the passage with each forcible effort to draw backwards; and with the effort, any mucus lodged within the passage would be removed. When the little tube was finally taken out the Valsalva drawing backward was forbidden, in order to favor surface healing. The present condition of the patient with a healed sinus is well marked in this photograph, which was taken only a few days ago.

In closing, I might make one other remark, which applies to both of these cases. Although the anterior ethmoid cells were engorged and the middle turbinal pressed tightly against the septum, yet in neither case was there any indication whatever of the antrum of Highmore being affected.

37 Carlton Street.

Oedematous Nodules of the Vocal Cords. L. RETHI. *Monatsschr. f. Ohrenheilkunde*, September 1905.

The author reports a case of a singer who had a spindle-shape swelling on the anterior half of the vocal cord, which disappeared when the organ was placed at rest, but appeared again as soon as an attempt was made to use the voice. This condition persisted even after the swollen mucous membrane was removed. Believing that he had to deal with a chronic oedematous swelling of the ligamentous structures of the cord, the author made four deep incisions into the cord, parallel with the free border. This procedure resulted in a complete cure of the case.

In a second similar case in which there was in addition to the swelling a nodule, situated upon the center of the swelling, he removed the nodule and then made similar incisions into the cord. The result was equally satisfactory.

YANKAUER.

270

THE RELATION OF PATHOLOGICAL CHANGES IN THE ACCESSORY NASAL CAVITIES TO DISEASES OF THE EYE.*

BY CHRISTIAN R. HOLMES, M. D., CINCINNATI.

This subject has become so extensive that in a paper like this, one must confine himself to a brief resumé of the most important facts. Although the anatomy of the nasal accessory sinuses of man has been well known for about thirty years, thanks to the indefatigable work of Zuckerkandl and others, and the comparative anatomy of these cavities has been worked out for some of the higher animals, their functional uses are still a subject of speculation for the physiologists who have evolved some most ingenious and interesting theories as to their various functions and reason for their existence. But a knowledge of the diseases of this part of the upper air tract is a matter only of the pathological yesterday.

This latter accomplishment is due to the rhinologists, whose daily contact with the nose and throat gradually impressed upon them the dangerous character of the inflammations of which they are frequently the seat.

Cases such as are now familiar to all of you, as lately as ten years ago were deemed to be in the province of the physician, the ophthalmologist or the dentist, and it was only when the rhinologist, with his special knowledge of the anatomy of the head and neck and his abundant clinical experience of the diseases of this region, began a systematic study of the accessory cavities for the purpose of working out a safe and intelligent surgical anatomy, that it was possible to present to the scientific world a complete exposition of the etiology, symptomatology, pathological anatomy, bacteriology and operative treatment of the diseases of the accessory sinuses of the nose. Their location, shape, structure and relation to important adjacent or surrounding structures, makes treatment or surgical interference often both difficult and dangerous. Their walls are frequently only of paper thickness, and in direct contact with vital structures. Under such conditions we are frequently unable to remove all necrosed bone. Take, for example, the sphenoid cavity; its walls are always thin, and at times dehiscent in the region of the optic nerve and cavernous sinus—we now know from postmortem reports that the walls are often necrotic—

*Presented at the 14th annual meeting of the American Laryngological, Rhinological and Otological Society, held at Pittsburg, May 28-30, 1908.

and while you may make a free opening in, or even remove all of the anterior wall, you cannot possibly, with safety, remove the other necrotic walls of this sinus—but must trust to the natural process of exfoliation and repair. Sometimes we have in any or all of these cavities septa and diverticula or irregularly projecting cells, that it is almost impossible to reach, unless the most radical operation is resorted to; and even then, the field is not always clear, especially in the region of the sphenoid. The natural openings into the cavities are so located, that in disease, drainage is greatly interfered with; and especially is this true in the case of the antrum of Highmore and sphenoid, where they are near the roof instead of the floor. The outlets from the other cavities are more favorably placed, but polypi or hypertrophied turbinals can most effectually close them off.

The manner in which infection enters these cavities in the vast majority of cases is through the natural openings when the patient is suffering from an acute or chronic infection of the Schneiderian membrane.

Dr. Robert Falcone recently tested the correctness of the theory of Harke and Hajeck, and proved that infected material may be forced into the sinuses during violent sneezing or blowing of the nose. These experiments were made on dogs; whether they will hold good to the same extent in man it is difficult to tell, but we do know that during the act of vomiting, some of the contents of the stomach have been forced into the accessory sinuses.

Infection, no doubt, sometimes extends from the nares to the sinuses through the blood and lymph vessels of the contiguously inflamed tissue,—swelling of the mucous membrane in the nose may occlude the natural openings which is soon followed by an absorption of the contained air, creating a vacuum. This leads to transudation of serous fluid into the cavity as we find it in the middle ear. This fluid forms a favorable medium for the development of pathogenic bacteria should any be present or gain entrance later. Carious teeth play a somewhat important role in the development of antral suppuration. While the dentists and many rhinologists formerly attributed nearly all cases of antral infection to dental disease, it is now generally accepted that from five to ten per cent is more nearly correct. From the specimens that I have examined, I feel convinced that the percentage must be small.

It must not be forgotten that the cavities having no connection with the teeth are just as liable, if not more so, to be infected, than is the antrum of Highmore.

Harke, in 37 postmortem examinations of children dying of diphtheria, whooping cough, scarlet fever, measles and chicken-pox, in every case found suppuration in one or more of the accessory cavities, the maxillary antrum being the most frequently affected. While children are frequently attacked, fewer cases come to operation than among adults, because, usually, their recuperative powers are greater than those of adults. The most frequent cause is undoubtedly influenza.

Dr. Darling, Pathologist to the Ancon Hospital, Isthmus of Panama, conducted an investigation to determine the relation of inflammations of the accessory nasal sinuses to pneumococcus infections. The sinuses were examined with regard to this point in 52 autopsies, 37 of which were pneumococcus infections, as follows: Lobar pneumonia, 22; acute pericarditis, 1; acute meningitis, 9; pneumococcus septicemia, 5. He found that 92 per cent of all pneumococcus infections coming to autopsy showed in a very marked degree more or less typical pneumococcus inflammation of one or more of the nasal accessory sinuses. The inflammation was generally intense. It was fibro-purulent in character. Pneumococci were always present, and in numbers dependent on the duration of the process. A point of great importance was that the age of the sinus infection had been appreciably greater than that of the lung or meningeal lesion. Ninety-one per cent of the lobar pneumonia cases showed a sinusitis. All cases of acute pneumococcus meningitis presented an inflammation of one or more of the sinuses, and in every one the middle ears and mastoid cells were normal. In the pneumococcus septicemia group 80 per cent were found to be associated with a sinusitis. In the case of acute pericarditis all the sinuses were involved. In fifteen autopsies of other than pneumococcus infections 28 per cent had an acute inflammation of the sinuses. Darling believes "that the portal entry of the pneumococcus is in most instances an accessory nasal sinus, the mucous membrane of which is probably fitted for the reception of the pneumococcus by an antecedent influenza or rhinitis."

Erysipelas has been regarded as a cause, but it can now be positively asserted that it is *secondary to sinus disease*. In a study of this subject which I undertook about a year ago, I found a vast mass of recorded cases, the details of which proved conclusively that attacks of facial erysipelas invariably arise from an infection due either to an increased virulence of the streptococci which inhabit the diseased nasal chambers, or to a reduction of the vital

powers of the patient inviting an infection by these micro-organisms, or, more probably, a combination of these two active factors in disease. Tuberculosis may, by ulceration and necrosis, extend from the nares into any of the sinuses. I have seen but few such cases, and cannot help wondering if they are as frequent as some would have us suppose. On the other hand, syphilis is frequent, but, as a rule, I have found that it yields readily to vigorous internal treatment. Malignant tumors may invade or develop within the cavities. It is needless to state that an early and correct diagnosis is of vital importance. If the disease is at all extensive, the prognosis is always very grave. It is remarkable to what an extent these growths may cause displacement of the contents of the orbit without interfering with vision, or even causing diplopia. This is, of course, explained by the absence of inflammation, and the slowness of the growth which enables the parts to adjust themselves to existing conditions. Individually I have come to the conclusion not to use the knife hereafter on malignant tumors in this region—it is so hopeless. I know of only one method that gives any hope at all, and I intend to use it in all future cases wherever possible. I refer to the cataphoric treatment of malignant growths by the Belton Massey method. Either use his hollow gold electrodes filled with metallic mercury, or the zinc electrode, amalgamated at the moment of using with sulphuric acid and mercury, is the proper method. By using from 400 to 1,000 milliamperes of current under a pressure of from 50 to 75 volts, most remarkable results can be obtained. Massey's explanation of the action of this cataphoric sterilization is as follows: "By the electrical conversion of metallic mercury injected into the growth into a soluble oxychloride, which is then diffused in all directions through the growth, the protoplasm of the cells, germs and all, is converted into an albuminate of mercury, rendering the dead mass thus formed aseptic and odorless until it drops off, leaving a clean wound to be healed by granulations. But the method does not stop its usefulness at the edges of the slough thus formed. This area of destruction, which should be coterminous with the supposed edges of the growth, is surrounded by a sterilized zone of varying extent, within which the diminishing density of the radiated chemical leads to the death of the lowly organized cancer cells only, the normal tissues being merely stimulated to a greater physiological resistance."

I used it successfully seven years ago in a case of sarcoma involving the tonsil and base of the tongue, and not as yet reported. Recently I have used it again in a case of sarcoma of the hard and soft palate the size of half a small orange, under general anesthetic of about one hour's duration, leaving the whole tumor a grayish white, shrunken, coagulated mass. This method is, of course, not applicable in a cavity enclosed by bone until you have surgically exposed the growth.

Non-malignant growths, such as fibromas, generally originate in the fibrous tissues beneath the mucous membranes of the naso-pharynx, and invade the sinuses or cranial cavity secondarily after the bony walls have been absorbed by pressure. They frequently set up a purulent sinusitis, a condition that adds to the danger of their removal. Such a case I reported last year in the *Ohio Medical Journal*. The growth was a dense fibroma arising from the fibrous tissues on the anterior surface of the sphenoid, and had eroded the bony structures in its neighborhood until it had invaded both frontal sinuses, the ethmoid labyrinth, the right maxillary antrum, and the anterior cerebral fossa.

A purulent otitis—for it was impossible to localize the process by an anatomical regional name, it was so diffused—complicated the case and made it one of that dangerous class to which I have referred, and a fatal ending followed five days after the operative removal of the growth.

The membranous lining of the sinuses may be regarded as a modified continuation of the Schneiderian membrane, Lothrop states that the mucous membrane which lines the frontal sinus "does not differ in essential characteristics from that found in the other accessory nasal cavities. In general, it is somewhat thinner than that found in the antrum of Highmore, and more easily detached from the bony wall of the sinus. In section it presents the following layers: Facing the cavity of the sinus is a layer of ciliated columnar epithelium between the cells of which are interspersed a variable number of goblet cells. The cilia produce a current toward the ostium frontale. Underneath the epithelium is a layer of loose connective tissue cells between the meshes of which are glands and round cells. This layer is capable of enormous increase in thickness, in consequence of inflammatory processes, by the addition of the serous element and leucocytes from the blood. The cavity of small sinuses may thereby be obliterated, and the consequent pressure gives rise to excruciating pain. The lining of the

frontal sinus contains fewer glands than that of the antrum, and their distribution over the surface is unequal. Underneath this loose layer we come to a rather dense basement layer, composed of compact fibrous connective tissue cells. This is next to the bone and serves as a periosteum. It is easily detached, except in the vicinity of the ostium frontale, where it is continuous, directly or indirectly, as the case may be, with the mucous membrane of the nasal cavity. Delicate vessels passing between the membrane and the sinus wall, help retain these structures in approximation."

Twenty years ago dacryocystitis was a very common affection, and many of us can remember seeing in clinic and private offices patients sitting about with silver probes projecting from their nasal ducts. I venture to say that you saw 20 of them to one that you see now. The oculists of those days were treating the symptoms instead of the disease, and continued to do so until the rhinologists discovered that tear sac affections are nearly always due to an inflammation having its primary seat in the nose. Treatment at the lower end of the canal, instead of probing from above will, as a rule, bring quick relief in acute cases. An undiscovered purulent inflammation of the antrum may extend to the tear sac, causing purulent dacryocystitis, for which the patient seeks the advice of an oculist,—I have described such a case in Hansel & Sweet's "Diseases of the Eye." In that case I found that we had to deal with a perisacular abscess—and every accessory cavity on that side was in a state of chronic empyema—all cured by a radical operation. Cysts may spring from any cavity. The frontal sinus is, perhaps, most frequently affected. The most typical case I ever encountered is also figured in the text book quoted above. It occurred in a woman about 55 years of age. The swelling appeared long before she sought advice. The globe was enormously displaced downwards and outwards—movements of the eye were almost entirely abolished. The cornea was exposed, requiring a pad and bandage over the lids for its protection, yet vision was practically normal and ophthalmoscopic examination negative, except for a slight dilatation of the veins,—operation revealed that the cyst had eroded all the anterior portion of the os planum and the anterior ethmoid cells, the floor of the frontal and most of the dividing septum between the two frontal sinuses. The contents were of a greenish brown color, and sticky, oily consistency. Analysis and bacteriological examination showing it to be mucous and free from organisms. These cysts are always of slow development, are firm,

elastic or semi-fluctuating on pressure at the center, but have a firm bony or ring-like feeling at the base. Epiphora, and in some cases, diplopia, are the only symptoms in this class of cases. The nasal examination is generally negative. The etiology of mucocoele is nearly always a previous catarrh, with closure of the ostium and accumulation of mucus, the external swelling not developing till months or years after the primary catarrhal attack. Turner states "that the ostium is generally closed during the formation of the mucocoele, but at the time of operation may be found open. In the latter case the contents of the cyst do not escape because they are too thick."

Osteomata are rare; they may develop in any of the cavities, or within the nose. They are usually pedunculated and of ivory hardness. They may extend into the orbit causing displacement of the globe with epiphora.

I recently removed one the size and shape of a hickory nut,—it sprang from the upper portion of the antrum of Highmore, growing into and obstructing the left naris and causing epiphora. It was removed through an extensive infra-orbital incision—a scar in this region indicating where a similar growth had been removed 18 years before—so that we may possibly regard this as a recurrent growth.

In considering the purely inflammatory conditions, we must divide them into two groups—acute and chronic, bearing in mind that the chronic varieties are liable to acute exacerbations, the pathogenic organisms becoming *for the time being very virulent*. Especially must we fear the streptococcus. It is during such periods of *increased virulence* that it behooves us to think twice before operating lest our case develop erysipelas (auto-infection) or the infection lead to venous thrombosis, meningitis, or brain abscess.

One of the most serious but infrequent results of a sinus infection is an infective thrombosis of the cavernous sinus with involvement of the contents of the orbit. One can readily see how infection or thrombosis may extend from the ethmoid vein into the ophthalmic vein and cavernous sinus, or by direct extension through the thin or dehiscant walls of the sphenoid cavity, just as we can trace the disease from the mastoid cells to the thrombosed lateral sinus.

An important point that I wish to emphasize is this—in purulent frontal, ethmoid or sphenoid cases (i. e. the cavities close to the

brain) we should avoid making any minor intranasal operation shortly before the radical operation is undertaken, because even a slight operative attack in an infected nose may cause an increased virulence of bacteria. Killian says "the most difficult thing is to estimate the virulence of the bacteria." In one acute case we may operate boldly with favorable results, while in another with apparently identically the same set of conditions, so far as we are able to tell by any and all means at our command, infection develops, and the case goes on to a fatal termination. We should therefore make it a rule, where possible, to operate as the general surgeons do for appendicitis; i. e., *after* the acute symptoms have subsided, or, if it should become absolutely necessary, make only a sufficiently large opening to drain the cavity *for the time being*. We should, of course, always be specially careful when in the region of the cribiform plate—or the exposed dura—where the inner table is necrosed. Here we often find ragged, unhealthy looking adhesions formed around the opening. This is the "phagocytic wall," nature's great barrier against meningitis, *and one we must not disturb!* The violation of this rule by the over radical operator, I believe, has cost many lives.

If we note how the veins from these infected sinuses, as, for example, the ethmoids and frontal, drain into the ophthalmic vein and cavernous sinus, or even pass through the bones in contact with the membranes of the brain, or enter the brain itself—we must marvel that there are not more fatal cases.

The light that has been thrown upon the etiology of many affections of the eye and its appendages, has resulted from the joint work of the ophthalmologists and rhinologists. It is not so many years since all headaches and eye pains that did not yield to the treatment of the family physician were sent to the oculist for glasses—and, for a time, the claims of the refractionist ran riot—according to some there was nothing that properly fitted lenses and prisms would not cure, from insanity to hemorrhoids. Many were cured because they *did* need glasses—others temporarily helped by "suggestion"—but a large percentage were not helped because the seat of the trouble was in the nose and sinuses, and not in the eye. We now know that the majority of these cases can be cured or relieved by proper treatment of the upper air tract—but here again we must not let our enthusiasm claim everything, for although in some cases the symptoms may be referred to the head, the cause may be located in a distant part of the body, as was well illustrated

in one of my patients, a woman of 38 years, well developed and nourished, who was under my treatment for progressive catarrhal deafness and tinnitus, with naso-pharyngeal catarrh—no sinus involvement could be demonstrated. While in my hospital she developed a violent attack of glaucoma, complicated with plastic iritis coming on the day her menstrual period began. From the history now elicited, I learned that she had during the past 18 months suffered pain and redness of the same eye at every menstrual period, which discomfort, however, generally subsided with the cessation of the flow. This was the first violent attack. A gynecological examination revealed the need of a curettment of the uterus, which was performed, and the eye became normal; and although several years have elapsed, she has never had the slightest irritation of the eye, which quickly regained perfect vision.

We have now many cases on record where partial or total blindness of one or both eyes with violent pains, has been promptly relieved by recognizing the presence of an empyema in one or more of the cavities, and instituting the proper treatment. In this class of cases it is nearly always the sphenoid cavity that is at fault, because of its intimate relation to the nerves, arteries, veins and muscles of the eye. The eye seldom causes any trouble with the nose and sinuses, but the latter very often involves the eye and orbit. It is important, therefore, that all ophthalmologists should know more about this subject in order to be able to recognize cause and effect.

St. Clair Thomson says that "many cases present themselves in the first instance to the ophthalmologist, so much do the eye symptoms induced overshadow all others."

In this class of cases we find as leading symptoms, pain, steady or intermittent, contraction of the field of vision, general asthenopic symptoms, hazy vision, tenderness of ocular muscles, inflammation of the conjunctiva and uveal tract, optic neuritis and atrophy; but this part of the subject I shall leave to one who, by his keen observations and facile pen has rendered most valuable service to our specialties—I refer to Dr. Posey, who honors me by opening the discussion on this paper.

The symptoms are indicated in the accompanying table:

| SYMPTOMS. | ANTRUM OF HIGHMORE. | FRONTAL SINUS. | SPHENOID CAVITY. | ETHMOID CELLS. |
|------------------------------------|--|---|--|---|
| Pain. | In teeth; in upper jaw and nasal bones only in frontal region. May radiate over whole side of head. | Supra-orbital—weight and oppression above and behind the eye. | Frequently occipital—sometimes exerting back of the eyes. Considered by some as the most characteristic. Sometimes in vertex, or in temples, frontal. Deeply seated in ear (In 9 cases out of 42 cases with autopsies). (Mastoid opened in 3 cases and sigmoid sinus opened in 3 cases). In 3 cases it was traced to other sinuses. Pain on opposite side. | Frontal—bridge of nose. |
| Tenderness. | Over the canine fossa and exit of the infra-orbital nerve. | Over the frontal region—supra-orbital notch—above the inner canthus. | Some observers have found none—but tenderness over the eye is frequent. | Above the inner canthus. |
| Discharge. | Can be seen covering the inferior turbinal and floor of the nose. | Can sometimes be seen coming down from the infratubulum. | Sometimes none visible to good observation. Sometimes thick pus on cavum pharyngeum. Sometimes far back in middle meatus. | Can be seen at various points in the vault,—location depending upon whether anterior or posterior cells, or both, are involved. |
| Swelling. | Sometimes quite marked over the whole upper jaw. Sometimes completely absent. | Not infrequent above the inner canthus and root of nose—sometimes due to external periostitis. | None external over face. Internal swelling of structures from middle turbinal up on affected side. St. C. T.'s case. Swollen purulent glands under sterno-cleido mastoid on affected side. Oedema of lids with thrombosis cavity. | None external—unless pus threatens to invade or invades orbit through plate of ethmoid—not infrequent in infancy. |
| Signs or symptoms on part of eyes. | Sometimes only congestion of conjunctiva. Lachrymation. Photophobia. Rarely orbital abscess. | Occasionally direct extension to orbit and formation of orbital abscess. Cornual abscess (Fisher). Erysipelas of eyelid. About sinus occurring during influenza are suggestive. Glaucoma? | Pressure symptoms upon one or all of motor and sensory nerves emanating from vessels of orbit and globe. Papillitis, oedema of optic nerve. When meningitis supervenes, unequal pupils, hazy discs, strabismus, etc. When cavernous thrombosis appears, proptosis and chemosis. Eyelids tense, discolored, edematous. Orbital abscess. Infrequently retraction of muscles of back of neck; twitching of muscles of upper extremity. (Meningeal or cerebral irritation). Author's case. | Orbital abscess not infrequent—sometimes it is the occasion for case being brought to surgeon. Erysipelas appearing about the orbit. Ocular symptoms in influenza are suggestive. Glaucoma. |
| Reflex signs. | | | | Asthmatic attacks in rare cases. |
| Transillumination. | Illumination of pupil abolished except where excess of pus. Opacity of cheek except as above. Absence of subjective light sensation in eye of affected side. | Results uncertain. Sinus sometimes very small or absent, which may give misleading dark shadow. | Slight or none. When cerebral complications begin temperature sometimes may range as high as 105 degrees F. | Usually moderate unless meningeal or orbital complications arise. |
| Fever. | Usually moderate or absent. | Usually moderate unless acute retention of pus occurs. | | |

Arteries and Veins.

NOSE.

Arterial Supply—Upper nasal region, anterior to the ethmoid cells, by the *ethmoid arteries*.

Artery of the Septum, a branch of the Spheno-palatine. Anastomoses anteriorly with the Descending Palatine from the Spheno-maxillary portion of the Internal Maxillary.

Posterior nasal branch of the Nasal or Spheno-palatine supplies the mucous membrane of the lateral wall of the nose.

Lateralis nasi from the Facial Artery supplies the ala and dorsum of the nose and anastomoses with its fellow of the opposite side, the nasal branch of the ophthalmic, the artery of the septum and the infra-orbital.

Nasal—the distal termination of the Ophthalmic—on the face—supplies the superficial structures of the nose and the lachrymal sac, and anastomoses with the angular from the facial and the vessels of the opposite side.

Infra-orbital supplies the lachrymal sac—anastomoses with the facial and ophthalmic.

NOSE.

Veins—1—*Plexus nasalis externus*—passing forwards to the external nares.

2—*Venae ethmoidales anteriores et posteriores* passing upwards into the cranial cavity and the orbit.

3—*A group passing backwards* to the soft palate and the pharynx.

4—*A group passing backwards and upwards* through the spheno-palatine foramen.

5—*A group passing through the cribriform plate* into the cranial cavity and anastomosing with the veins of the Pia Mater.

In addition to these five groups, the *plexus lacrymalis*, a most important set of vessels, penetrates the nasal and maxillary bones to empty into the nasal vein system on the face. This plexus establishes an additional, almost direct connection between the nasal cavities, the orbit and the structures of the face.

ETHMOID LABYRINTH.

Arterial Supply—*Ethmoidal arteries* anterior and posterior.

Posterior Nasal, a branch of the Nasal or Spheno-palatine from the Internal Maxillary.

Veins—*V. Ethmoidales Anteriores et Posteriores* pass upward toward the cranial cavity and the orbit, through the cribriform plate to the veins of the dura mater and the longitudinal sinus and to the veins of the orbital part of the frontal lobe of the brain, while others are deflected right and left through the anterior and posterior ethmoidal foramina to the ophthalmic vein which empties into the cavernous sinus.

FRONTAL SINUS.

Arterial Supply—*Ethmoidal Arteries* (anterior) from the Ophthalmic.

Branches from the *Spheno-palatine*.

Numerous minute vessels from the bony walls which help to bind the sinus wall and the lining membrane together.

Veins—Join the *V. Ethmoidales Anteriores et Posteriores*.

SPHENOID SINUS.

Arterial Supply—*Posterior Nasal*—branch of the Nasal or Spheno-Palatine from the Internal Maxillary.

Veins—Join the *V. Ethmoidales Ant. et Post.*

MAXILLARY ANTRUM.

Arterial Supply—*Alveolar* branch of the Internal Maxillary.

Infraorbital branch of Spheno-maxillary portion of Internal Maxillary.

Posterior Nasal, a branch of the Nasal or Spheno-palatine from the Internal Maxillary.

Veins—The major part of the blood is carried by a group of nasal veins (*Zuckerkandl's fourth group*) which passes backward and upward through the foramen spheno-palatinum into the canalis spheno-palatinum to join the maxillary veins on their way to the external jugular.

Nos. 8-10 East Eighth Street.

NEUROSES OF THE NOSE.*

BY CHARLES PREVOST GRAYSON, M. D., PHILADELPHIA.

I have the somewhat uncomfortable feeling that you will discover within the next few minutes that you have been made the victims of misplaced confidence on the part of your committee who did me the honor to invite me to present this paper. I shall make no attempt to be ponderously scientific, nor have I any intention of yielding to the temptation that this opportunity offers to add something new and startling to the already formidable list of reflex nerve disturbances for which the nose has been held responsible. On the contrary, I am very much of the opinion that before any further addition is made to this list, the foundation upon which it rests should be critically examined to see if it be secure enough to support even the strain to which it has already been subjected. I am conscious that there is in this statement at least a suggestion of doubt on my part as to whether the nose is really accountable for all those ills of reflex nature that have been attributed to it. I know that whenever it has been charged with any offense of this kind more or less evidence has been forthcoming to substantiate the charge, but, although I do not venture to say in the majority, yet in many cases at least this evidence has been of a purely circumstantial character and has seldom been sufficient to induce me as one of the large jury of rhinologists to concur in a verdict of "guilty." In almost if not all of them the "neurotic temperament" has formed a more or less conspicuous background to the various manifestations of nerve irritation, and the vagaries of this irresponsible temperament are unfortunately apt to be as misleading as they are notorious. In the *absence* of this powerful contributing factor, I should regard the prompt and permanent cure of an asthma, for instance, by the removal of a septal spur as forming a *prima facie* proof of nasal guilt, but whenever its presence can be demonstrated or even fairly suspected, the possible indirect and psychic effect of the operation would lead my conscience to decline any greater responsibility than would be involved in rendering against the nose the shifty Scotch verdict of "not proven." In the face, therefore, of the adverse criticism that I may perchance draw

*Read at the 14th annual meeting of the American Laryngological, Rhinological and Otolological Society, held at Pittsburg, May 28-30, 1908.

upon my head, I say without equivocation that to my mind whenever this troublesome temperament forms one of the premises in any proposition of a pathological nature, it vitiates and lays open to suspicion and dispute any positive conclusion that may be drawn. It is because of this embarrassing uncertainty that must always confront one in that class of nasal neuroses in which the nose is presumed to be the excitant of a reflex disturbance, that I find much greater satisfaction in dealing with that other class in which the nose itself is the site of the disturbance of innervation, that class in other words in which symptomatically the nose is the victim rather than the aggressor. The clinical features of these affections are so distinctive, so almost unique, that it is probably extremely seldom that we encounter any difficulty in the matter of diagnosis. How fortunate it would be, both for us and our patients, if our pathway to a complete understanding of the pathogenesis were as free from obstacles! I shall not occupy your time with any consideration of the functional derangements of the olfactory nerve. Ordinarily, these are of comparatively slight clinical interest and importance. It is rather to the vaso-motor neuroses as they are exemplified in the nose that I would venture to ask your attention, and I can clearly foresee the shudder with which you will suspect me of an intention to rake over the ashes of past discussions of hay fever. But this is not my principal purpose. My chief wish is to assist, simply as a mark of respect, at the obsequies of the latest "specific" for the treatment of that disease. I am not privileged to sit with the mourners, for almost from the moment of its birth I anticipated, predicted, and was prepared for its early death. And yet, I wish to lay a flower upon its grave because "pollantin" was conceived in a scientific spirit, the methods by which it was made were equally scientific and the reasoning that led to its production was, so far as it went, perfectly sound. But it went neither far enough nor deep enough. If it had, it is highly probable that no claim of specific virtue would have been made for the remedy. If the etiology of hay fever comprised no more than two factors—a predisposing idiosyncrasy and an atmospheric excitant—there would have been nothing illogical in the expectation that "pollantin" might take its place beside the antitoxin of diphtheria, but when we recognize the existence and fully appreciate the nature of the systemic condition that, it seems to me, is more or less clearly in evidence in every case of this disease, we will not be surprised at the percentage

of cases that have been reported as but slightly improved or absolutely unimproved. For many years I have believed that a fundamental disturbance of the nutritive processes, of normal metabolism if you please, was responsible for the essential nervous element in the causation of hay fever. So long as we have a blood current contaminated with a number of toxic materials, the products presumably of sub-oxidation, so long are we almost certain to have nerve centres that are poorly nourished, over-sensitive to disturbing influences, and of reduced power to neutralize the effects of such influences. It seems to be, at least in hay fever, the vaso-motor centres that are earliest and most markedly affected, and when we have added to this not only the idiosyncrasy, but possibly also a long precedent intra-nasal lesion that has helped to make the pituitary mucous membrane particularly intolerant of any form of irritant, we have but to await the floating of some variety of pollen or other obnoxious material within the nostrils to witness the speedy evolution of the symptom complex of this disease. If there is one fact connected with hay fever that, to my mind, throws a stronger light upon its remote causation than any other, it is that the affection is pre-eminently one of that class of people who lead the strenuous rather than the simple life. Why is it, may I ask, that these people have an almost exclusive monopoly of what we are pleased to term idiosyncrasies? Why is it that the laboring class is practically exempt from this species of affliction? Is it not because of the facts that its members go to bed with the chickens and rise with the lark, that they have their three frugal meals each day on the stroke of the clock, that, plain as it is, their supply of food is more often inadequate to even satisfy their appetites than to satiate them, that each day's labor involves wholesome muscle work that induces wholesome fatigue and brings dreamless sleep, and that, finally, their brains and nerves know nothing of emotional strain, of vaulting ambition, of crushing disappointment, or of sleep destroying passions of any kind? Is it not possible, think you, that if, instead of fulfilling her natural destiny, bare-footed, short-skirted, uncorseted Maud Muller had married the Judge, if she had flung aside her rake, had abandoned the cows that she had milked, the churn that had helped to make her broad of shoulder and deep of chest, and if she had substituted for these all the nerve shattering follies and vices of the modern society woman—Heaven forbid that I should attempt to enumerate them!—might there not have come

a time and a condition, I ask you, when even the dim memory of raking hay would have sufficed to throw her into a paroxysm of sneezing? It may seem scarcely worth while to indulge in speculations concerning the nature of idiosyncrasies, but I have often thought that if we, as we all of us do, have certain conscious likes and dislikes, is it not possible that we have others, also, that are subconscious? Cannot our respective mucous membranes, for instance, owing to some individual peculiarity of structure or innervation, have certain antipathies of their own of which we may be wholly unconscious until lowered vitality, increased peripheral nerve irritability and lessened central control permit them to emerge from the obscurity of the back of the stage into the glare of the limelight at the front? I have fancied that we may either inherit or acquire in some way the seeds of these idiosyncrasies, but that they may lie fallow and inert until they are fertilized by and spring into life and offensive activity from a soil of poisoned and debilitated nerves.

What a sublimely sanguine nature it must be, then, that still clings to the hope that a remedy of specific power may yet be discovered for hay fever! When a man so qualified by exceptional experience and unimpeachable judgment as Holbrook Curtis commits himself to the statement that "hay fever is a disorder amenable to no specific treatment," it seems to me that there is nothing left for the rest of us but to accept his opinion and to finally abandon that fatuous hope to which I have just alluded. And so, upon the tributary wreath that I cast upon the sod that covers "pollantin" I would write the inscription "*Sic semper specifics.*" One more word relative to the treatment of this disease and I will take my leave of it. With no lack of respect for the profound laboratory studies that have dealt with the secretions of the hay fever sufferer, I fail to find in their results anything that is of genuinely practical value to us. It may be of some academic interest to know that the sweat contains an excess of something, that the tears that flow so abundantly during the attack contain too much or too little of something else, or that the saliva, perhaps, shows the presence of some material that is foreign to it, but of infinitely greater importance is it to remember and to remove the basic nutritive fault that is accountable for such alterations. This is a matter I think, to which the maxim "*Immanente causa non cessabit effectus*" is clearly applicable. Surely the drug treatment of hay fever, from a curative point of view, is utterly

irrational and fallacious. Nothing short of a drastic and radical reform of each patient's personal hygiene can effect and maintain the normality of the body tissues and secretions. I speak feelingly because as an ex-victim of the disease of some years' standing, I am confident that if I were to renounce systematic exercise and to return to indolence and the flesh-pots, the coming of August would find me once more a refugee in some mountainous region or upon the rag-weedless bosom of the Atlantic. If I were asked, therefore, in which of the two places, the laboratory or the gymnasium, a cure for this disease were the more likely to be found, you probably know what my answer would be. To put it in a nut-shell, it is my belief that if a man takes care of his muscles, with *all* that this implies, his nerves and vaso-motor centres will take care of themselves.

Another nasal neurosis very closely allied to hay fever, in fact, almost identical with it symptomatically, is that termed "rhinorrhoea spasmodica" or "paroxysmal sneezing." Pathologically, it seems to be hay fever minus the latter's idiosyncrasy concerning external irritants. The irritants of internal production are no doubt precisely the same in the two affections, and in both, also, the secondary nervous element is equally in evidence. This latter, however, in rhinorrhoea spasmodica is more often temporary than temperamental. In other words, the disturbance of vaso-motor equilibrium is the result in most of these cases of some accidental and transient stress of an emotional nature, and it is this which may partially account for the absence of any periodicity in connection with repeated attacks of this disturbance. In illustration of this statement, I may be permitted to briefly refer to three cases that I have seen within the past two months, in none of whom could any evidence be found that would justify their being regarded as either hereditary or habitual neurotics, and none of whom had ever had a previous attack of this nature. The first was a man of middle age who was deeply involved in the stock market last Fall and who throughout the Winter was compelled, for want of margin, to let his holdings go one by one until, with the coming of Spring, he was as much a nervous as a financial bankrupt. The second, a woman who, during the several weeks of its closely preceding critical illness, could scarcely be dragged from the bedside of her child. And finally, a trained nurse of rather frail physique who, for an unbroken period of six weeks, had been vigilantly watching a patient possessed of a suicidal

mania. The pathogenic fact that was common to these three cases was a prolonged and flagrant violation of those laws of personal hygiene relating to food, sleep and exercise, and the result, common also to all of them, was a most pronounced impairment of nutrition and of nervous vitality. Associated with the auto-toxemia and nutritive failure were both unusual phosphatic waste and defective elimination. Although in each of them there was only such intranasal abnormality as would, under ordinary circumstances, have produced no discomfort, yet aided and abetted by the foregoing conditions it proved quite sufficient to induce indignant Nature to select the nose as the medium for her protest.

In conclusion, gentlemen, I am going to recall to your attention a third neurosis of the nose that has its origin in disorderly sexual functions. In the first place, we are all familiar with the fact that during the menstrual period not only is any coincident affection of the female nose apt to be aggravated, but even if it be normal it is often apt to reflect to some extent the ovarian excitement. It was perhaps his knowledge of this fact that led Doctor —— to seek a cure for dysmenorrhoea through the cauterization of those areas in the nose that showed most plainly the secondary hyperemia and hyperesthesia. Shortly after the publication of his observations probably many of us through the kindness of our obstetric and gynecologic friends had opportunities for testing his conclusions, but I must confess that the results of my own series of cases developed little more than the opinion on my part that while in women functional derangement of the pelvic viscera was capable of producing more or less disturbance of the neuro-vascular mechanism of the nasal mucosa, yet that the control of this latter would have little or no appreciable effect upon the former. Always excepting, of course, the highly neurotic woman, and upon her there is scarcely anything in the fields of medicine, surgery, Christian science or osteopathy that may not produce the most extraordinary cures. In close connection with this, it is just barely possible that some few of you may have a dim recollection of a paper that I read at the semi-centennial meeting of the American Medical Association in 1897, concerning the influence of sexual excitement upon the intranasal circulation. The two cases that I then reported have since been followed by many others, and, could I conquer my aversion to hair-splitting distinctions in the sub-classification of disease types, I would venture to suggest to the author of the next text-book on diseases of the nose

that he devote a section to "The Rhinitis of the Newly-Married," or, perhaps, "Honeymoon Rhinitis" would be shorter and more euphuistic. I have not introduced this subject in order to discuss its treatment, because as a consistent bachelor I could scarcely do otherwise than advocate preventive rather than curative measures, but I refer to it once more simply to express the opinion that the cause of this neurosis of the nose is as frequently overlooked or viewed with the same indulgent indifference to-day as it was ten years ago.

No. 251 South Sixteenth Street.

Acute Diseases of the Eye Following Acute Nasal Disease. E.

BAUMGARTEN. *Monatsschrift f. Ohrenheilkunde*, May, 1906.

The author reports a number of cases in which one or more ocular symptoms, such as exophthalmos, swelling of the eye-lids, lacrymation, diplopia and paralysis, and neuralgia, were associated with acute accessory sinus disease, and were not relieved until the nasal condition was recognized and treated. This therapeutic result is regarded as proof of a causal relationship between these disease conditions.

YANKAUER.

The Bier Treatment of Middle-Ear Disease. L. FLEISCHMANN.

Monatsschrift f. Ohrenheilkunde, May, 1906.

The author reports twenty-four cases of middle-ear suppuration, most of them acute, some with more or less pronounced mastoid symptoms, and a few chronic cases, treated, *lege artis*, with passive hyperemia. A perusal of the histories of these cases makes one far from enthusiastic over this plan of treatment, and the author, in summing up, says: "Passive hyperemia clouds the clinical picture, converts manifest into obscure conditions, and tempts us to delay which may prove fatal to the patient."

YANKAUER.

A NEW FLAP IN THE RADICAL OPERATION.*

BY GEORGE A. LELAND, M. D., BOSTON, MASS.

Some investigations I have been making for two or three years have resulted in the production of a flap for closing off the aditus from the mastoid cavity. Dr. Crockett has it down on the program as a new flap. I do not know whether it is a new flap or not, but I have not been able to find it in the literature. We have all probably had to go through the mastoid operation a second time. Then the patients kick, because they think it was not done properly the first time. I confess that the first secondary mastoid that I did I thought that the first operation had not been properly done; but after investigating a number, I concluded that it does not make so much difference how they are done first; whether they are properly cleaned out or not, they may be just as likely to need a secondary operation. These secondary operations come from a few weeks or months to a few years after the first. I have had occasion to operate during the last four or five weeks on four cases of secondary mastoid; some of the first operations I had done myself, some had been done by others. One recurred eleven years after the primary operation. In one of these cases I had operated on the child in infancy after scarlet fever. A year afterwards he was operated on for a secondary mastoid at the Carney, which was evidently done all right. Within the last two or three weeks I have had to operate again for a large amount of cholesteatoma which destroyed the whole cavity, and in that case the radical operation was done. The question arises, how can we stop the secondary infection of these mastoids? In these secondary mastoids, where we open up the old scar, we find there is a direct passage down into the middle ear through the aditus, lined with granulations in a fibrous envelope. Outside of this fibrous tissue there is more or less production of new bone. Now, if the aditus is not closed off there is no reason why this tract should not have a secondary infection, as well as the first one. The middle ear is infected up through the tube, and then the infection goes up through the aditus and through this soft space leads to the outside surface and an abscess appears. In talking this matter over with some of the New York men, the desirability of shutting off the aditus, provided it was not shut off by the proper deposition of

*Stenographic report of remarks made at Boston meeting of Eastern Section of the American Laryngological, Rhinological and Otological Society, January 4, 1908.

bone, was admitted. Dench and I thought that we would put a piece of sterile rubber tissue down over the aditus. I tried it several times, but of course it was not successful, because the middle ear side of the tissue was subject to infection, while the other was imbedded in granulations, so that these little pieces gradually floated out, and I had to go back to the old packing. On talking it over with Dr. E. H. Nichols, our surgical pathologist, I asked him if a piece of periosteum would live if put down over this aditus, separated from its attachment. Of course, that would not grow unless it were nourished, and he suggested that if I could get a large enough flap from the posterior surface of the mastoid it might grow if there were large enough attachment to give it nourishment. So for the last three years, after excavating acute cases, I have been taking a very large flap of periosteum from the bone back of the ear and packing the posterior end over the aditus, bending the bone surface forward to be applied to the posterior meatal wall. I may not live long enough to know whether these cases ever become infected again, especially if they are going to last eleven or more years before they have another infection, but theoretically and certainly in most cases this flap closing off the aditus will be sufficient to avoid further infection of the mastoid cavity. The periosteum forms a layer of bone, which closes off the aditus, and the posterior or skin surface grows fibrous tissue, which assists in filling the mastoid cavity. Nichols also said that if the flap were not long enough it would contract. I found that to be the case, and therefore have had to increase the length of the flap. The ordinary curvilinear incision is made through the skin and superficial muscles, so that we have a considerable thickness of tissue. This leaves more thickness between the fascia and the bone. Then the incision through the periosteum and overlying tissue is made from the mastoid tip upward and backward along its posterior border, then horizontally backward for half an inch or more, then upward to the temporal line, then forward on this line to the posterior mastoid limit, and then upward and forward through the temporal muscle, if necessary, to meet the first superficial incision. The idea is, we have got to take rather more periosteum than we might think would be necessary. After the cavity is well excavated, this tip is put down over the aditus and packed firmly with small pieces of gauze or wicks. Then at the first dressing, four or five days after, provided the temperature has not risen, these wicks are not disturbed, but the rest of the cavity is unpacked and redressed. At the second dressing, three or four days later, on taking out the

wicks, the flap will generally be found to be fastened over the aditus by firm adhesions. In some cases I did not get a large enough piece of periosteum, and at the second dressing I found that the periosteum had lifted up. I have one case here now where the periosteum had lifted up and did not cover the aditus; so I gave him ether, tore the periosteum loose where it had adhered to the posterior wall, and moved it over the hole, and now you will see that it has grown there, although it does not look so; but I have tried a probe and found it soft all the way down, with no passage into the aditus. If we have not obtained enough flap, and find that it does not cover the aditus, we can take away more or less of the posterior bony wall. We find at times that there is a good deal of tissue in the flap, making it quite thick, but this is an advantage, because it contributes to its nourishment, and also fills the cavity somewhat.

Now it occurred to me that if we could go still further and obliterate the posterior excavated cavity which results from the radical operation, we could save the patient a great deal of trouble from the treatment that is almost always necessary at intervals, for the removal of effete epithelium, wax, etc., that is so annoying. In these cases, after taking away the posterior wall, I have taken this flap and put it right down upon the facial ridge, pushing some of it down into the aditus, which of course is open, as well as the antrum, i. e., I shut off the aditus with the flap and have its edge fastened upon the facial ridge. In that way is made a new partition between the middle ear and the posterior cavity. The posterior canal wall is split, according to the method most desirable for the case in hand, and then the middle ear and canal are firmly packed, the anterior packing being made to fill out even with the facial ridge; then the periosteal flap is adjusted to the ridge and the aditus and anchored there by firm packing as in acute cases, and the posterior cavity is packed tight. At the first dressing, several days later, we take away the lighter packing behind, and do not disturb the packing on the periosteum. At the second dressing we can take this away carefully, not, however, disturbing the packing in the canal. About the third dressing we can take this out, and in most cases, so far as I know (of course, I have not done it a great many times) the periosteum has adhered firmly in position upon the facial ridge, and the posterior cavity being then packed lightly, fills up very rapidly. Finally the middle ear is dermatized. I have not yet tried to dermatize it at the first operation, because I wish to be pretty sure that the flap was in good position. Only in one case have I had any difficulty, and in that case the lower part of the

periosteum did not adhere, and there is a small cavity at the posterior inferior part of the wound. That, I think, was my first or second case. In a secondary operation I have had just lately the periosteum was almost useless, as it had a weak place in it at the middle, and the lower part sloughed out. This case proved to have an hereditary specific taint, and healed very poorly, so that the flap operation was a failure. One point I have learned to avoid in treating these chronic cases, and that is, placing the flap down there and expecting it to anchor itself and grow if the case is not a strong, vigorous and healthy one. If the healing is sluggish, the periosteum contracts and does not adhere, and therefore we have to go back to our old packing and dermatization just as before. If then the periosteum does not adhere we are not any worse off than before.

I have several cases here to show; one is a case of mastoid with hardly any pus in the cavity. I put the flap down, and it stayed, and the middle ear drained up through the external canal. The flap was not washed off or in any way compromised by the pus. In some of these cases which I have tried at the South Department, where the infection was extreme, there was a great deal of pus, and the necrosis was rapid. Here the flap always floated out. I have also tried it with the blood clot, as suggested by Sprague and seconded by Blake; but they were not successes. Now, if this firm fibrous tissue of the periosteum covers the aditus, the posterior cavity becomes a simple wound, to be filled with granulations, and the proliferation of the tissue from the posterior surface of the flap assists and hastens the process of healing very greatly. I also show two cases healed after radical operation, with no posterior cavity and the external canal only a little larger than normal; and five cases nearly healed after operation for acute mastoid, one double.

354 Commonwealth Avenue.

A Note of Hypopharyngoscopy. HAROLD S. BARWELL. *Lancet*, August 17, 1907.

Describes the method devised by von Eicken of Freiburg of inserting a stout laryngeal probe between the vocal cords which can be drawn forward, so as to expose new growths in the post-cricoid region.

THOMSON.

REPORT OF A CASE OF PROBABLE PERSISTENT ANGIO-NEUROTIC EDEMA OF THE LARYNX AND SOFT PALATE.*

BY T. H. HALSTED, M. D., SYRACUSE, N. Y.

At the meeting of this Society held in New York City one year ago, I presented for examination and diagnosis a case which excited a good deal of interest among those of the Fellows who examined the patient. The case was that of a young woman with an obscure infiltration of the soft palate and larynx, and will be recalled by some present. While in New York she was also examined, at his office, by Dr. Prince Morrow, the distinguished dermatologist and syphilologist, who was as uncertain as to the nature of the disease as were the laryngologists who examined her. I reported the case as possibly one of persistent angio-neurotic edema, and in reporting the progress of the case to-day I do so under the title of "Probable Angio-Neurotic Edema," showing the continuing uncertainty of my opinion.

Syphilis, tuberculosis, or lupus was the opinion of perhaps the majority, while a few others thought it might be the result of some undiscovered circulatory or lymphatic disturbance, or related to some disease or disturbance of some one of the internal secretory organs. Without exception, no Fellow felt confident of his opinion. Professor Killian, who examined the case with great care, thought it probably syphilitic.

Miss E. V., age 30 years, bookkeeper, living in Cortland, N. Y., consulted me on June 15, 1905, because of a thickness and fulness in the throat, dyspnea on exertion, post-nasal and nasal discharge, excoriation of left nostril, and frontal pain. These symptoms had followed a quinsy which occurred four months before, and which had not entirely cleared up after the abscess was lanced. On examination there was an apparent collection of fluid in the right anterior pillar of the fauces, the velum palati was thickened, the uvula swollen, and arytenoids were pale and swollen. There was some dry crusting over the middle turbinate and a little pus in the right middle meatus, coming apparently from the anterior ethmoid. Transillumination was

*Read before the annual meeting of the American Laryngological, Rhinological and Otological Society, held at Pittsburg, May 28-30, 1908.

negative. Nothing adventitious in the chest. No sputum. Temperature normal. She had lost ten pounds in weight during the past three months, and was on her way to the Adirondacks through the advice of her physician. I incised the swollen anterior pillar and let out a few drops of pus. I suspected tuberculous disease of the larynx and soft palate. I did not see her again for five months, when she returned and presented almost exactly the same condition as on my first examination. In the meantime she had hawked out a flat thin piece of bone, as large as the thumb nail, which had come from either the nasal septum or the ethmoid.

There was a leathery, pale infiltration of the uvula and soft palate, both arytenoids were swollen, pale pink, edematous in appearance, but leathery to the probe, pyriform in shape, the epiglottis upper surface infiltrated. No ulceration, no pain, no dysphagia, but dyspnea on slight exertion. The septum was superficially ulcerated and crusted on both sides, no bare bone detected anywhere, some ethmoidal suppuration on right side, the nose at the tip reddened, and some excoriation at nostrils. Repeated examinations of sputum were negative. Nasal scrapings were negative. Temperature taken several times a day, and for many days, was normal. Pulse normal. General health good, no loss of weight. Repeated urinary examinations by competent men were always normal. Gastro-intestinal tract was normal.

Family History.—I have never been able to obtain a very satisfactory family history, never having seen any other of the family than the patient. Her own physicians in Cortland, first Dr. Carpenter and latterly Dr. Dana, both of whom have been greatly interested in the case, and well acquainted with the family, have never discovered any history or evidence of tuberculosis or syphilis or other constitutional dyscrasia in the family. The mother is living and well. Father died of pneumonia a month ago.

Previous History.—At six years of age patient had scarlet fever, followed by enlarged cervical glands, which finally subsided without suppuration, but an ulcer of the lip extending into the nostril persisted for four months, finally healing without scars. No other illness of note until she was 18 years of age, when she suffered a great deal from chilblains, and about this time a small swelling occurred over one heel. This suppurated,

the bone was curetted, and after several months the wound healed, leaving a scar. This was said to be scrofulous.

The patient now enjoyed good general health, without any local disease anywhere, for 12 years, i. e., until she was 30 years of age, when she first came under my observation with the condition as described at the beginning of the report.

The condition then, three years ago, was a distinctly leathery, pale, swollen infiltration of the uvula and soft palate, especially of the right anterior pillar, epiglottis pinkish, edematous on its anterior surface and margins, a pale edematous pyriform swelling of both arytenoids, partially obscuring the vocal cords, which, however, were normal. In the nose was a crusting or scabbing of the septal mucous membrane, a fissure at nostril and some redness of tip. Voice was clear, slight dyspnea on exertion, with at times severe exacerbations, requiring sitting up in bed at night, these exacerbations lasting a few days and subsiding, no pain whatever either on swallowing or referred to throat or ear, no cough, no expectoration, no pyrexia. General health good. Heart, lungs, kidneys, gastro-intestinal tract all apparently normal.

Such was the condition when she came under my care three years ago. It continued the same until she appeared before this Society one year ago, with the addition, however, that a month prior to coming to the meeting she had an attack of what her physician diagnosed as facial erysipelas, differing from erysipelas in that a thickening of the lip and of the skin over the cheeks persisted after the active disease had subsided, and was present when I presented her to the Society.

After first coming to me, three years ago, repeated examinations of the sputum and nasal secretions and scrapings were made for tubercle bacilli, but none were ever found. Temperature was always normal. She was early placed on anti-syphilitic treatment extending at intervals over long periods of months, iodine in its various forms, the iodide of potassium up to 200 grains a day, and mercury in various forms, by mouth and inunction. Various applications were made locally. Nothing had any appreciable effect, the disease not progressing but not subsiding. She was repeatedly seen with me from the beginning by Dr. H. C. Baum, a dermatologist and syphilologist, and it was at his suggestion that I had her seen by Dr. Prince Morrow, of New York.

Dr. Morrow could find no evidence of any inherited or acquired syphilis, and thought the skin infiltration of the lip and face were not erysipelatous, but would not make a diagnosis. He suggested, however, the use of salicylate of mercury hypodermatically, a suggestion also of some of the laryngologists who examined her. Other suggestions made at this meeting were excision of a piece of the infiltrated tissue for microscopic examination, especially with reference to lupus, and the tuberculin test. I have not thought it wise or safe for the patient to make use of either of these two measures, desirable as they might be from a diagnostic point of view.

A course of salicylate of mercury has been given, consisting of twenty deep hypodermic injections. During the past year there has been no material change in the local condition of the uvula, soft palate and larynx. The same pale, leathery, edematous infiltration which you saw a year ago persists, although the swelling seems to be slightly less, and dyspnea is seldom complained of, and acute exacerbations of difficult breathing do not occur. The nasal condition is unchanged. In the face, however, there has been a very decided degree of activity. During the year she has had five or six attacks of what her physician at home, Dr. Dana, at first regarded as facial erysipelas, but he has now given up that opinion. Dr. Baum and I have always regarded them as angio-neurotic edemas. Without any known or apparent cause, there comes on suddenly great redness and swelling of the face, usually of one cheek, often of both, sometimes involving the dorsum of the nose and lip, no pain, but a burning sensation. This usually reaches its height in a few minutes or hours, sometimes extends, often does not. Once it occurred immediately following, in my office, a salicylate of mercury injection, so that the face became greatly swollen, cheeks deep red, one eye nearly closed, all coming on in a few minutes. Sometimes the temperature reaches 104° F. during the attacks, at other times temperature is not elevated. When these facial swellings first occurred she stayed in bed, and the disease was treated as erysipelas; of late she pays no attention to them but continues at her work as embroiderer, and finds herself recovering as quickly while up and attending to her work as formerly when she remained in bed. Since her first facial attack, more than a year ago, there has been constantly and persistently some swelling, brawny, and rather leathery, of the skin of the upper lip, right cheek, and

rather edematous of the loose tissue under the lower eyelids of both sides, the so-called attacks being apparently but acute exacerbations of what I believe is a persistent angio-neurotic edema involving the face. In other words, I believe that the scene of activity has shifted from the pharynx and larynx to the skin of the face, while still persisting in these first locations. I feel certain that there is some underlying cause, constitutional or local, some dyscrasia, or some local source of toxic absorption, the nature and source of which we do not know.

831 University Block.

A Case of Ankylosis of the Stapes. R. SCHILLING. *Archiv f. Ohrenheilkunde*, July, 1906.

The patient was suffering from chronic middle ear suppuration on the right side; from vertigo, and tinnitus and progressive deafness on the left. Examination of the left ear showed diminished hearing for the low notes, negative Rinne. There was no change in bone-conduction upon compressing the air in the canal. (Gelle.)

The suppurative process on the right side lead to meningitis and death, microscopic examination of the left ear showed the presence of several areas of rarefying otitis in the neighborhood of the promontory, one of which involved the foot-plate of the stapes, causing complete ankylosis. The usual changes in the nerves were also found.

YANKAUER.

At the last meeting of the Mississippi Valley Medical Association the following officers were elected for the ensuing year: Drs. J. A. Witherspoon, Nashville, Tenn., President; Louis Frank, Louisville, Ky., First Vice-President; Albert E. Sterne, Indianapolis, Ind., Second Vice-President; S. C. Stanton, Chicago, Ill., Treasurer; Henry Enos Tuley, Louisville, Ky., Secretary. The next annual meeting will be held in St. Louis, in October, 1909.

CONSERVATIVE TURBINECTOMY.*

BY J. A. WATSON, M. D., MINNEAPOLIS.

Every surgical operation is in a certain sense and to a certain extent an evil, and the only justification for its performance is that it should be the lesser of two evils between which we are compelled to choose. Especially is this true of operations which involve the sacrifice of organs or parts of organs that subserve special and important functions, as for instance the turbinate bodies of the nose. Since the respiratory function of the turbinates, namely the warming, moistening and filtering of the inspired air, is a function essential, not merely to health, but to continued existence, and since it can be performed vicariously by the mucous membrane of the throat and bronchial tubes only very imperfectly and with imminent danger to the integrity of those structures and of the whole respiratory system, it is evident that we have considerations quite sufficient to "sickly o'er the native hue" of our present rather enthusiastic resolution "with the pale cast of thought." There are nevertheless insistent indications for the performance of this operation. They may be epitomized as follows:

When the respiratory function of the nose, that is, its ability to warm, moisten, and filter the inspired air, is impaired to such an extent as to cause the patient serious discomfort or be a menace to his health; when further, it cannot be sufficiently improved in any other way, and when, lastly, it is evident that the contemplated operation will actually improve or at least conserve it, and not merely increase the absolute breathing space at the expense, perhaps, of further impairment of the function by destruction of a large extent of functioning tissue, we have a combination of circumstances that renders turbinectomy the lesser of the two necessary evils. This discussion excludes turbinectomy performed for the purpose of gaining access to the sinuses, or for malignant disease. It also excludes operations on the middle turbinate, though it is often necessary to remove this organ or a portion of it for the purpose of improving the nasal respiration.

Having observed this proper conservatism in the mental processes whereby we arrive at a determination to perform the operation, we must now carry our conservatism into the actual per-

*Read before the Hennepin County Medical Society, June 15, 1908.

formance of it. It must be our endeavor to remove enough if possible to provide sufficient breathing space, but to leave enough to insure against serious interference with the respiratory function of the nose. Since we are obliged to steer between this Scylla and Charybdis, we must on the one hand graze the rock if necessary to do so in order to save ourselves from the depths of the whirlpool, but on the other hand we must elect to feel the suction power of the latter if we can in no other way escape being dashed upon the rock.

Apart altogether, however, from the question of the absolute amount of tissue to be removed, there are at least two other factors which must enter into our consideration of the subject, factors which have an important bearing on the one hand upon the actual breathing space to be obtained, and on the other upon the conservation of turbinate function. They are first, the site of the tissue to be removed, and second, the direction and character of the section. As far as the first is concerned, it should always of course be our object to remove only that portion of the turbinate which by reason of its situation and enlargement is the actual cause of the obstruction or at least of the greater part of the obstruction. Nevertheless it is not always possible to confine our section entirely to the hypertrophied portion, nor, as will be shown, is it always absolutely desirable even when possible. The free edge of the turbinate at least must always be included in the section whether it be hypertrophied and obstructive or not. But furthermore, the section should often be extended antero-posteriorly to include a certain amount of normal turbinate tissue in order that the section itself may preserve a desirable character and direction. On the other hand it is not always by any means necessary to remove all of the hypertrophied portion, since the subsequent contraction of the scar may be depended upon to reduce the hypertrophy to some extent, and since the above mentioned incidental removal of some of the normal tissue aids in the establishment of a proper breathing space. Bearing in mind the fact that even hypertrophied turbinate tissue doubtless always possesses more or less functioning power, it may be stated that the amount of hypertrophied tissue removed should bear as far as possible a certain inverse proportion to the amount of normal tissue which it is found necessary to remove. The more of the latter which must be removed in order to make a desirable section, the less of the former, that is of the hypertrophied tissue,

should be removed, and vice versa. These various considerations bear an interdependent relationship which only experience and careful judgment will enable us to appreciate and utilize.

But what are the characteristics of a desirable section? First of all, the line of section from its anterior to its posterior extremity should be a straight line. It should be free from kinks or curves or corners or angles, such as are likely to follow any but the most careful use of scissors or forceps or any instrument which necessarily does its work by a series of bites or cuts. Especially pernicious is the practice we have all sometimes seen of cutting backward horizontally in such a series of jerks, perhaps close to the attachment of the turbinate, and then, as it were, emphasizing our approval of this angular method by chopping off the section perpendicularly at its posterior extremity with the wire snare. Such corners and angles often retard healing seriously or even postpone it indefinitely, since they are very likely to fill up with masses of granulations which refuse to cicatrize, obstruct breathing, retain secretions, and encourage crust formation. The very object of our operation is thus often defeated, for the unhealed wound with its unhealthy secretions and decomposing crusts will often irritate and congest the remaining turbinal tissue to such an extent that the last condition of the patient is worse than the first. Far better would it have been indeed to have removed a little less of the actually hypertrophied tissue and if necessary a little more of the apparently healthy tissue in order to have insured to the patient the quickest possible healing of a clean-cut, healthy wound. It is always desirable, when it is possible, to remove a V-shaped section and approximate its edges so as to leave no uncovered raw surface. Yankauer's method of removing a V-shaped section and suturing its edges together with a view of obtaining primary union would be ideal were it not that it is both technical and difficult, requiring special and complicated instruments, a much greater degree of skill than the average, and more time than can be devoted to many of these operations by a busy rhinologist. I have lately devised an instrument which I have found to be of great service in the majority of cases where it is found necessary to remove an anterior or middle hypertrophy of the inferior turbinate. It consists of an outer tube presenting on its upper aspect a slot of three-sixteenths of an inch in width. The edges of the slot are sharp, and the distal extremity of the tube is scoop-shaped, which enables the operator to engage in it

more readily the anterior extremity of the turbinate. A knife, which is also in reality a section of a tube accurately fitted within the outer tube, revolves in this outer tube in such a way that its cutting edge, as it passes across the slot, shears off cleanly everything that projects into the tube, whether soft tissues or bone. The actuating mechanism consists of a collar encircling the backward extension of the outer tube, which collar slides forward in response to the closure of the convenient and forceps-like handles of the instrument. A trunion screw, surrounded at its extremity



by a roller to reduce the friction, passes through this collar, then through a longitudinal slot in the backward extension of the outer tube and through a spiral slot in the backward extension of the inner tube or revolving knife.

My method of using the instrument is as follows: In most cases, at least where it is intended to include in the section the very anterior extremity of the turbinate, it is advisable to separate this extremity from its most anterior attachment to the nasal wall by a short vertical incision at this point with forceps or scissors. This step may be omitted, where the turbinate is very dependent,

presenting, as we often see, a definite, free anterior edge. It is now possible to introduce a blunt instrument, such as the round cornered handle of a small scalpel or the extremities of the closed blades of a strong turbinate scissors, under the anterior part of the turbinate, and pry it away from the outer wall and towards the septum. One should in fact aim at bringing its anterior extremity opposite or nearly opposite the centre of the nasal vestibule, since such a position greatly facilitates the introduction of the instrument. It is nevertheless quite possible to introduce it in most cases without any preliminary section and prying over of the turbinate. Now, bearing in mind the conformation of the turbinate, and either with or without the aid of a speculum the turbinotome is introduced so as to engage in its distal extremity the presenting anterior portion of the turbinate. The instrument now usually slips backward without any necessity for the use of force, the edges of the slot cutting easily through the soft tissues down to the bone, if necessary, to allow of its adaptation to the irregularities of the organ. Once the anterior portion of the turbinate is engaged in the instrument, the speculum, if one has been used, should be dispensed with, as it is unnecessary and indeed impossible to any longer observe by its aid the interior of the nose, the vestibule being more or less completely filled by the turbinotome. To some extent, however, the instrument is its own speculum. One is at least able to see the anterior portion of the turbinate coming forward as it were through the bore of the instrument as the latter is passed backward. It is a mechanical impossibility to remove or injure with the revolving knife anything not included in the lumen of the turbinotome, and it is equally an impossibility to include anything but the lower portion of the inferior turbinate. The instrument should pass backward nearly parallel to the floor of the nose if it is desired to extend the section far posteriorly. The shorter the section is to be, however, the greater should be the angle at which the distal end of the instrument approaches the floor. If it is desired to remove a section of the greatest possible width, the instrument should be introduced so that the cutting slot is at its highest part, the whole instrument being at the same time crowded upwards so as to pack as much as possible of the soft tissue along the edge of the bone into its calibre. It is possible on the other hand to reduce the width of the section by rotating the instrument on its long axis in such a way as to bend the inferior edge of the turbinate more or less toward the septum and

at the same time bringing the cutting slot to a relatively lower position. On closure of the handles all the included tissues are severed and usually brought away in the lumen of the instrument. Sometimes however the section is not quite completed posteriorly, owing to the lower edge of the distal extremity of the turbinotome impinging upon the floor of the nose before the cutting slot has carried the incision altogether through the edge of the turbinate. In this case the section may be completed with the snare, as all that remains of it is too insignificant to make any appreciable irregularity. The line of section is now found to be geometrically straight antero-posteriorly. But furthermore, while it is not exactly V-shaped, it is at least distinctly concave from side to side, the bone being cut about one-sixteenth of an inch higher than the soft tissues, a circumstance which greatly favors healing if the packing be so introduced as to gently compress the soft edges over the bone, but which on the other hand might greatly retard healing were the packing carelessly introduced so as to force the soft edges apart rather than together.

When the turbinate is very large, and especially when the hypertrophy extends far up above its free edge, it is a great advantage to first outline a V-shaped section along the hypertrophied portion with a small scalpel, and to separate the soft tissues from the bone for a short distance above the section. The bone with soft tissues attached along its edge is then removed with the turbinotome and the edges of the wound brought into apposition by properly introduced packing. The packing should first be placed under the turbinate and then above the turbinate and between the turbinate and the septum.

The actual removal of the turbinate, once the instrument is in place, is instantaneous and painless. The disagreeable grating sensation occasioned by the saw and the grinding, crushing sensation accompanying the use of the forceps and scissors are alike absent. If the mucous membrane of the septum be slightly anesthetized and the turbinate fairly anesthetized, there is only the somewhat uncomfortable feeling of having the nose filled by rather a large instrument.

This instrument cannot be introduced on the side of the convexity of a deflection of the septum or of a spur or ridge which extends far forward. A turbinectomy however is practically never indicated under such circumstances. One's attention should rather be directed towards the septum. In perhaps fifteen to twenty-five

per cent of adult cases, however, my experience being not yet large enough to enable me to estimate it more exactly, the pyriform opening is too small to allow of its successful use. Once it engages the turbinate there is very rarely any obstacle to its further introduction, since there is always plenty of room for one lateral half of the instrument between the turbinate and the septum, and for the other lateral half between the turbinate and the outer wall of the nose. In case adhesions between those structures should prove to be an obstacle they can be easily broken down, and it is in fact necessary to break them down whatever method is used.

Since having had this instrument manufactured I find that Pyncheon of Chicago has devised a small instrument for removal of the posterior tip of the turbinate along somewhat similar lines.

Note.—During a discussion following the reading of this paper at a meeting of Hennepin County Medical Society some of the speakers took exception to the writer's use of the term turbinectomy, taking the view that this term should be applied only to operations in which the whole turbinate body was removed, and that operations involving the removal of only a portion of the turbinate should be called turbinotomy. The writer, however, cannot agree with any such nomenclature.

Iridectomy means a cutting away of a very small portion of the iris. It is not necessary to remove the whole iris in order to perform an iridectomy. Iridotomy means merely some form of incision into or through the iris. The term tonsillectomy may properly be applied to the cutting away of any portion of the tonsil. A cutting into the tonsil should be described by the word tonsillotomY. Turbinectomy also properly means a cutting away of even a portion of the turbinate, turbinotomy merely an incision into the turbinate, as for instance the submucous section that is so often resorted to for the purpose of reducing congestion, and it is thus, if we would avoid confusion, that we must distinguish between cutting into any organ and the cutting away or the removal of even a portion of the same organ.

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